Overland Storage

SnapSAN® 3000/5000 Disk Array

User Guide

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Preface

This user guide explains how to install, setup, and use your new Overland SnapSAN Manager Embedded software and its SnapSAN 3000/5000 disk array to perform tasks such as create arrays and logical volumes, modify configuration settings, and take snapshots.

This guide assumes that you are familiar with computer hardware, data storage, and network administration terminology and tasks. It also assumes you have basic knowledge of Internet SCSI (iSCSI), Serial-attached SCSI (SAS), Serial ATA (SATA), Storage Area Network (SAN), and Redundant Array of Independent Disks (RAID) technology.

Product Documentation and Firmware Updates

Overland Storage SnapSAN product documentation and additional literature are available online, along with the latest release of the SnapSAN 3000/5000 software.

Point your browser to:

http://docs.overlandstorage.com/snapsan

Follow the appropriate link to download the **latest** software file or document. For additional assistance, search at http://support.overlandstorage.com.

Overland Technical Support

For help configuring and using your SnapSAN 3000/5000, search for help at:

http://support.overlandstorage.com/kb

You can email our technical support staff at techsupport@overlandstorage.com or get additional technical support information on the Contact Us web page:

http://www.overlandstorage.com/company/contact-us/

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Conventions

This user guide exercises several typographical conventions:

Convention	Description & Usage
Boldface	Words in a boldface font (**Example**) indicate items to select such as menu items or command buttons.
Ctrl-Alt-r	This type of format details the keys you press simultaneously. In this example, hold down the **Ctrl** and **Alt** keys and press the **r** key.
NOTE	A Note indicates neutral or positive information that emphasizes or supplements important points of the main text. A note supplies information that may apply only in special cases—for example, memory limitations or details that apply to specific program versions.
IMPORTANT	An Important note is a type of note that provides information essential to the completion of a task or that can impact the product and its function.
CAUTION	A Caution contains information that the user needs to know to avoid damaging or permanently deleting data or causing physical damage to the hardware or system.
WARNING	A Warning contains information concerning personal safety. Failure to follow directions in the warning could result in bodily harm or death.
Menu Flow Indicator (**>**)	Words in bold font with a greater than sign between them indicate the flow of actions to accomplish a task. For example, **Setup > Passwords > User** indicates that you should press the Setup button, then the Passwords button, and finally the User button to accomplish a task.

Information contained in this guide has been reviewed for accuracy, but not for product warranty because of the various environments, operating systems, or settings involved. Information and specifications may change without notice.

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Chapter 1

Overview

SnapSAN 3000/5000

This manual describes how to use the Overland Storage SnapSAN 3000/5000 system. The appliance together with the SnapSAN 3000/5000 software provides a flexible, intelligent, iSCSI-based storage area network (SAN) solution for virtualized server environments and the growing demand for data storage. With a SnapSAN 3000/5000 appliance, you can store, share, protect, and manage data through a single easy-to-use Windows or web interface.

Figure 1-1: SnapSAN 3000/5000 24-Slot and 12-Slot Models

Features

High Performance and Large Capacity

- The disk array supports the following host interfaces:
  - Fibre channel (FC-AL/Fabric, 8Gbps)
  - iSCSI (1Gbps, 10Gbps)
- The disk array supports the following disk drives:
  - 300 GB (15Krpm), 450 GB (15Krpm), 600 GB (15Krpm), and encryption 600 GB (15Krpm) 3.5 inch SAS disk drives
  - 300 GB (10Krpm), 450 GB (10Krpm), 600 GB (10Krpm), and encryption 600 GB (10Krpm) 2.5 inch SAS disk drives
  - 1 TB (7.2Krpm) and 2 TB (7.2Krpm) 3.5 inch NL-SAS disk drives
  - 1 TB (7.2Krpm) 2.5 inch NL-SAS disk drive
  - 400 GB 3.5 inch SSD
  - 100 GB 2.5 inch SSD

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- On the SnapSAN 3000 series, up to 96 disk drives can be installed.
  On the SnapSAN 5000 series, up to 144 disk drives can be installed when using a 2.5-inch disk drive. When using a 3.5-inch disk drive, up to 96 disk drives can be installed.
- SAS disk drives, NL-SAS disk drives and SSDs can be installed together on a disk enclosure.
- The disk array can be connected as a storage system AIX servers.

Other Features

- Key components such as controllers, cache memories, power supplies and fans are redundantly configured.
- Cache data is dually written to controllers. Even if a controller fails, integrity of the data on the caches of the other controller is maintained.
- Data on caches is automatically saved in the internal flash memory by using the battery power when a power outage occurs.
- The disk array supports RAID-1,5, 6, 10, 50, 60, and TM by default. Even if a disk drive fails, operation can be continued without causing data loss.
- Multiple hot spare disks can be configured.

Operation Management

SnapSAN Manager allows for basic configuration settings, status display and status monitoring easily. The SnapSAN Manger Suite program (not included), allows for centralized management of multiple disk array controllers and use of function extension programs.

Components

Disk Array Controller

This section describes names and functions of disk array components.

Front View

Figure 1-2: 2.5 Inch Disk Drive Model

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Figure 1-3: 3.5 Inch Disk Drive Model

Figure 1-4: Front Bezel (Optional)

For information on removing the front bezel, see *"Front Bezel"*.

Figure 1-5: Disk Drive Front View

Label	Description
ID LED (blue)	This LED is used to identify the unit.
Service LED (orange)	These LEDs indicate the status of the disk array controller.
Power LED (green)	
Standby LED (white)	This LED indicates the DC off and on operation is available.
Disk drive/Dummy carrier	Up to 24 disk drives/dummy carriers can be installed on the 2.5 inch disk drive model. Upto 12 disk drives/dummy carriers can be installed on the 3.5 inch disk drive model. • Disk drive: Hard disk drive with a dedicated carrier (HDD) or SSD. • Dummy carrier: Dummy to prevent wind blow.

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Label	Description
Key cylinder	The key cylinder is used to lock the front bezel when it is attached to the unit.
Active LED (green)	Each disk drive has one each of these LEDs. The LEDs indicate the disk drive status.
Fault LED (orange)	
Ejector	The ejector is used to remove and attach the disk drive from or to a disk array controller or a disk enclosure.

Rear View

The following graphic shows the rear view of a SnapSAN disk array with the power supplies on top and controllers on the bottom (SAS 4-port controllers used in this example).

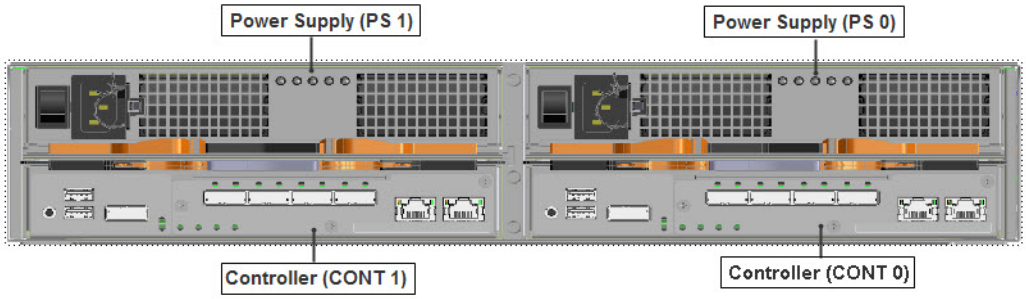

Figure 1-6: Rear View of Disk Array Controller

Label	Description
(1) Power supply (PS0/PS1)	Two power supplies are installed on a disk array.
(2) Controller (CONT0/CONT1)	Two controllers are installed on a disk array.

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Power Supply

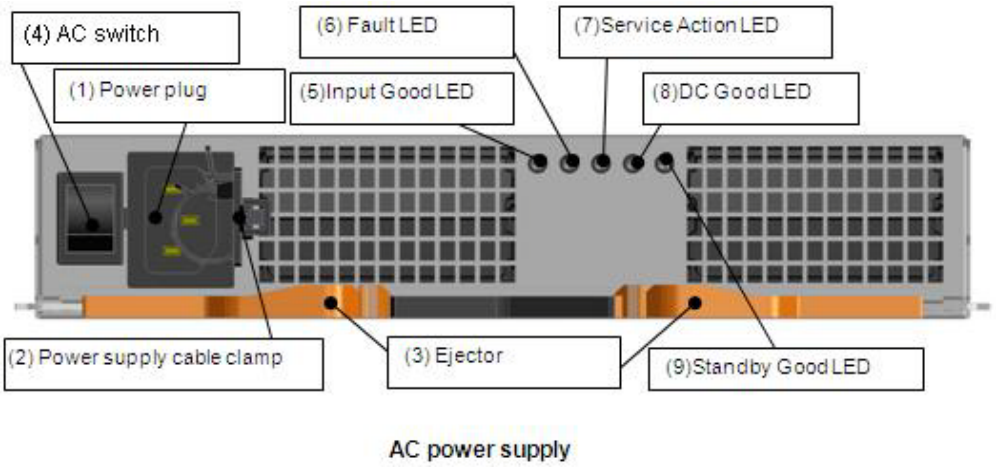

Figure 1-7: AC Power Supply

Label	Description
(1) Power Plug	Use the power cable shipped together with the disk array for supplying power to the disk array.
(2) Power Cable Clamp	The power cable clamp prevents the power cable from coming off unintentionally.
(3) Ejector	The ejector is used to install and remove a power supply.
(4) AC Switch	The AC switch is used to power on and off input of power supply.
(5) Input Good Led (Green)	This LED is lit if power is supplied when the AC switch is turned on.
(6) Fault Led (Orange)	This LED is lit when an error is detected.
(7) Service Action Led (Blue)	This LED is not used in this disk array system. The LED is not lit all the time.
(8) Dc Good Led (Green)	This LED is lit when DC output is normal.
(9) Standby Power Good Led (Green)	This LED is lit when DC output is in the waiting status.

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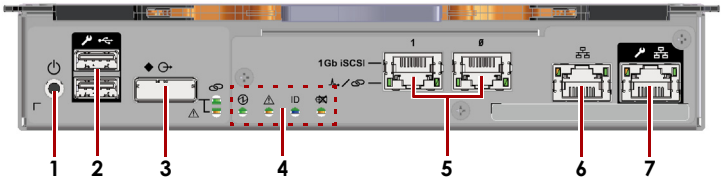
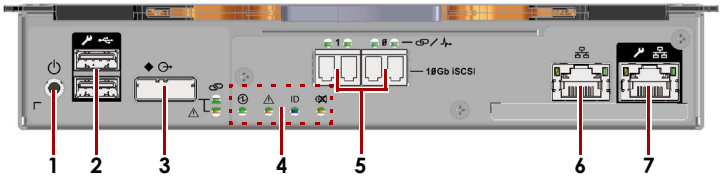
Controller Connections

The connections for the various controllers is shown below.

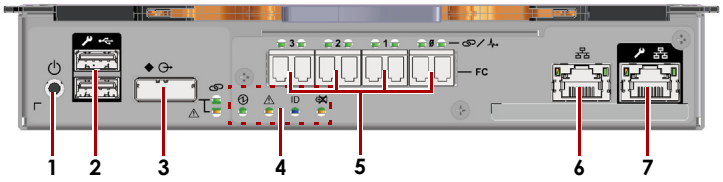
1 GB iSCSI 2-Port Controller



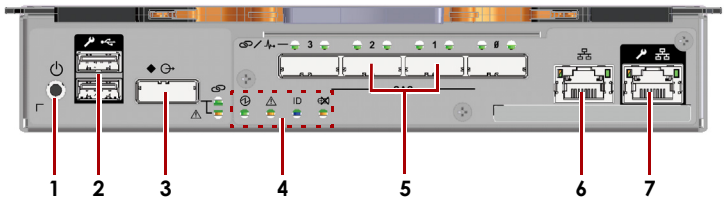
10 GB iSCSI 2-Port Controller



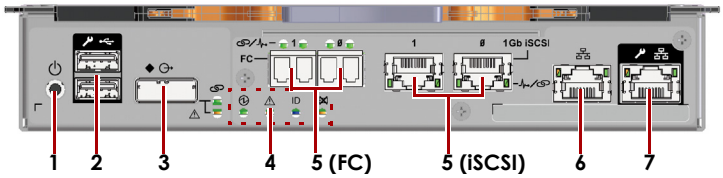
FC Controller, 4-Port (SnapSAN 5000)*



SAS 4-Port Controller



FC 2-Port/1 GB iSCSI 2-Port Controller (SnapSAN 5000 Only)



1 - DC Button
2 - USB Ports
3 - Expansion Port
4 - State LEDs
5 - Host Ports
6 - Management
7 - Maintenance

* SnapSAN 3000 uses a 2-port version of this FC Controller.

Figure 1-8: Available Controllers

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Label	Description
(1) DC Button	The DC switch is used to start up or shut down the disk array system in non-AC operating mode. In AC operating mode, the DC switch only allows for shutdown of the disk array system. There are two types of shutdown; normal shutdown and forced shutdown. When this switch is pressed four or more seconds, forced shutdown is performed. For information on AC operating mode, see the description about AC operating mode in *Section : "Powering On the Disk Array System"*.
(2) USB Port	These USB 2.0 ports are used for debugging. They are not used under normal operation.
(3) Disk Port	The disk port is used to connect to the next disk enclosure. A controller has one disk port. The port has a fault LED (below the port) and a link LED (above the port).
(4) State Display LED	For details, see *Section "LED Display"*.
(5) Host Port	Host ports are used to connect hosts. The port connector form, the number of ports and the position of LEDs to show the status vary according to the controller type.
(6) Management Port	The management port is a 10M/100M/1Gbps LAN port used for SnapSAN Manager and SNMP connection. The port has a LINK/ACT LED (right) and an SPEED LED (left).
(7) Maintenance Port	The maintenance port is a 10M/100M/1Gbps LAN port used for connecting a maintenance PC. This connector is not used under ordinary operation. The port has a LINK/ACT LED (right) and an SPEED LED (left).

Disk Enclosure (Optional Component)

This section describes names and functions of disk enclosure components.

Front View

The front view of a disk enclosure is the same as the front view of the disk array controller. (DAC).

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Rear View

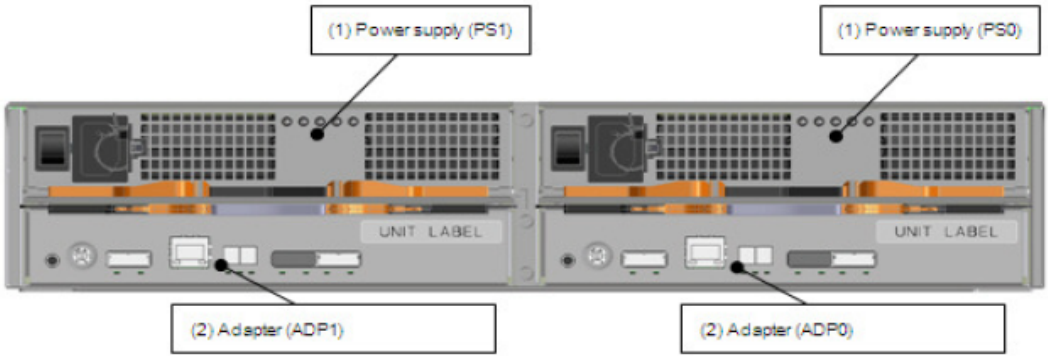

Figure 1-9: Disk Enclosure Rear View (with AC Power Supplies)

Label	Description
(1) Power supply (PS0/PS1)	Two power supplies are installed on a disk enclosure.
(2) Adapter (ADP0/ADP1)	Two adapters are installed on a disk enclosure.

Power Supply

Power supplies of a disk enclosure are the same as the power supplies of the disk array controller.

Adapter

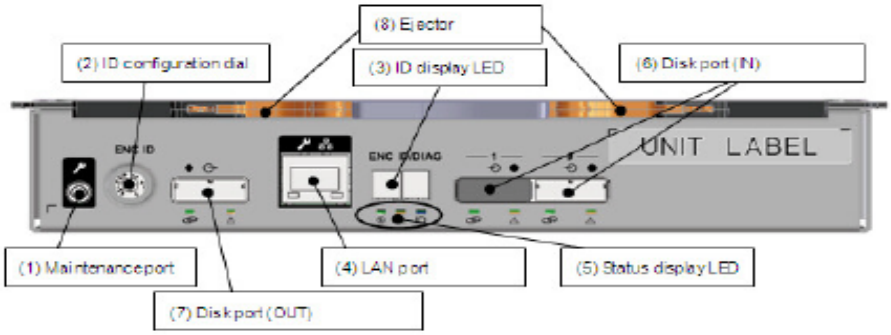

Figure 1-10: Adapter

Label	Description
(1) Maintenance port	This port is for maintenance. This port is not used under normal conditions.
(2) ID configuration dial	The ID configuration dial is not used.
(3) ID display LED	The ID display LED is not used.
(4) LAN port	The LAN port is used for maintenance. It is not used under normal operation.

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Label	Description
(5) Status display LED	For details about the status display LED, see *"LED Display"*.
(6) Disk port (IN)	A disk port (IN) is used to connect the disk array controller or disk enclosure located before the given enclosure. Each adapter has two disk ports for (IN). Typically, only the right (IN) port is used. Each port has a fault LED (right) and a link LED (left).
(7) Disk port (OUT)	The disk port (OUT) is used to connect the disk enclosure behind the given enclosure. Each adapter has one disk port (OUT). Each port has a fault LED (right) and a link LED (left).
(8) Ejector	The ejector is used to attach and remove the adapter.

LED Display

Disk Array Controller, Disk Enclosure, and Disk Drives

The front view of a disk array controller, a disk enclosure and disk drives (without the front bezel).

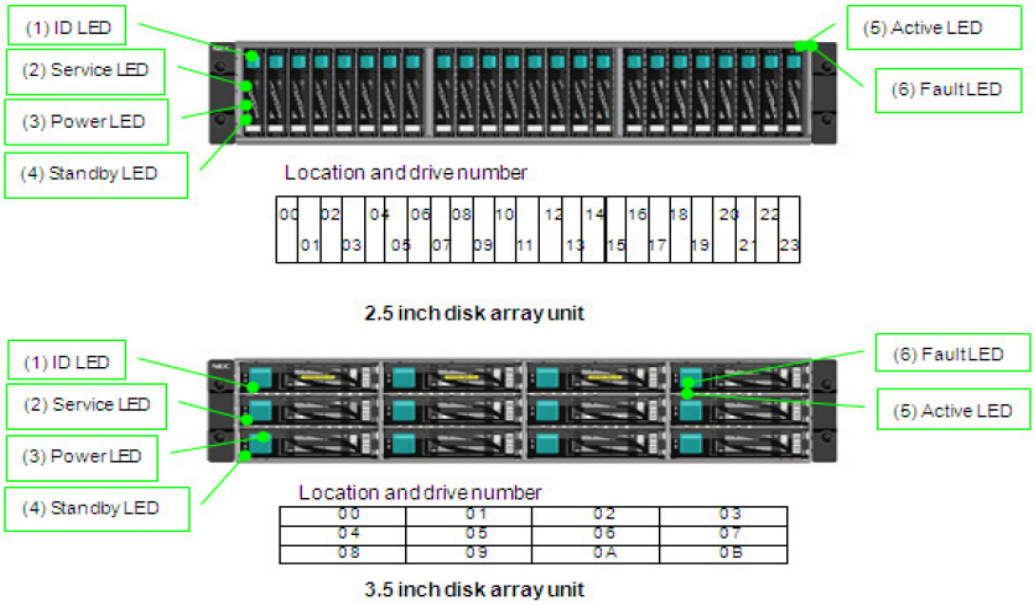
(1) ID LED
(2) Service LED
(3) Power LED
(4) Standby LED
(5) Active LED
(6) Fault LED
Location and drive number
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
2.5 inch disk array unit
(1) ID LED
(2) Service LED
(3) Power LED
(4) Standby LED
(6) Fault LED
(5) Active LED
Location and drive number
00 01 02 03
04 05 06 07
08 09 0A 0B
3.5 inch disk array unit

Figure 1-11: LED Display - Disk Array Controller, Disk Enclosure, and Disk Drives

(1) ID LED	Status
Not lit	Not selected
Lit	Selected

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(2) Service LED	(3) Power LED	Meaning
Not lit	Lit	Running successfully.
Lit	Lit	Maintenance being required or being performed (such as in the course of recovery).
Lit 0.2 seconds Not lit 0.2 seconds	Lit	In the course of power on.
Lit 4 seconds Not lit 8 seconds	Lit	Maintenance being required (Backup has failed. Written data may have vanished.)
Lit 1 second Not lit 1 second	Lit	Firmware being updated online.
Not lit	Lit 0.2 seconds Not lit 0.2 seconds	Auto flashing (*) has finished and power can be turned off.
Not lit	Not lit	Powered off.

When access to a host connection port is disconnected for five minutes, transition to this mode takes place automatically in preparation for power-off. When access from the host connection port is restored, ordinary status is restored.

(4) Standby LED	Status
Not lit	DC on and off operation is not available
Lit	DC on and off operation is available

(5) Active LED	(6) Fault LED	Status
Not lit	Not lit	Powered off.
Lit	Not lit	Ordinary (READY)
Flashing	Not lit	Ordinary (in the course of ACCESS)
Flashing	Flashing	Recovered
Lit	Flashing	Hard disk drive save-energy mode
Lit	Lit	Failure

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Disk Array Controller Power and Disk Enclosure Power

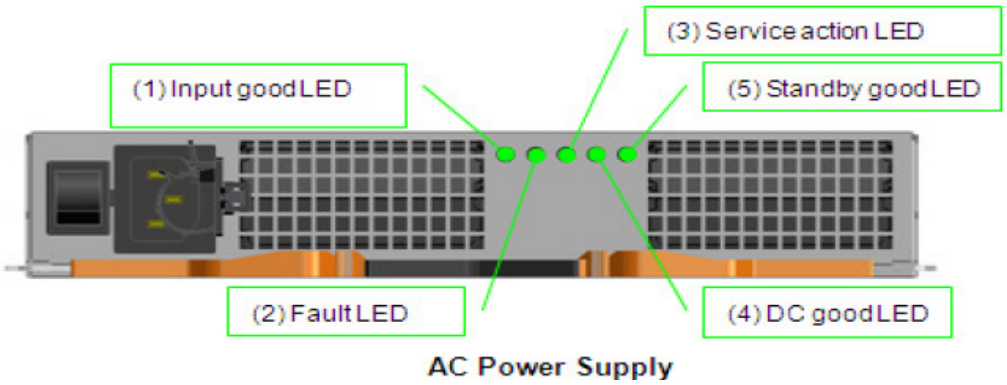

Figure 1-12: LED Display - Disk Array Controller Power and Disk Enclosure Power

(1) Input good LED Green	(2) Fault LED Orange	(3) Service action LED Blue	(4) DC good LED Green	(5) Standby good LED Green	Status
Lit	Not lit	-	Lit	-	Running successfully.
Lit	Lit	-	Lit	-	Problem in power supply fan. Power supply temperature warning.
Lit	Lit	-	Not lit	-	Power supply output problem. Power supply temperature problem.
Lit	-	-	-	Lit	INPUT-ON (12V and 5V no output, 5Vstb output).
Not lit	-	-	-	-	Input problem.

The service action LED is lit when directed by a device connected to a port or the system.

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Controller (CONT)

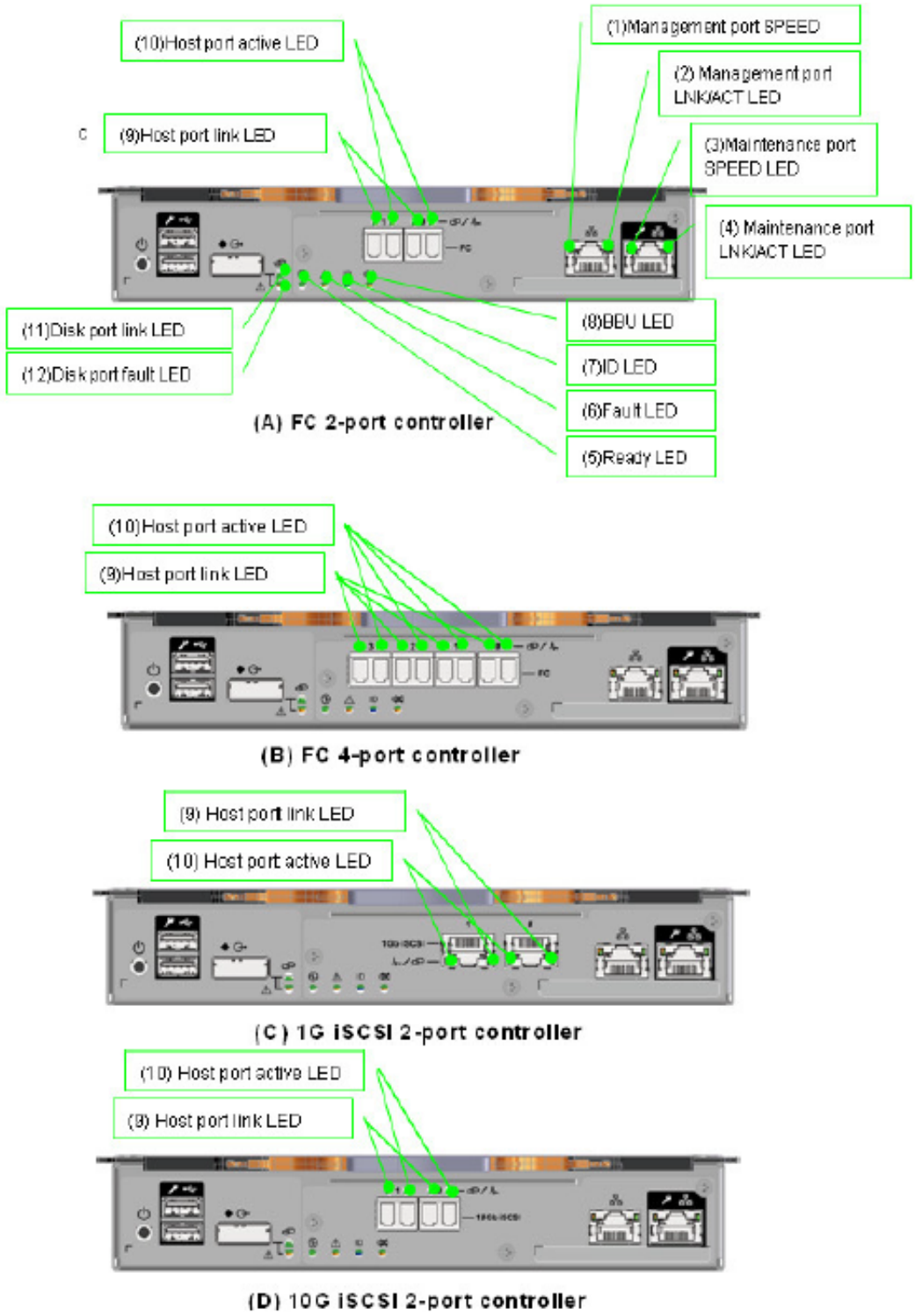
(10)Host port active LED
(9)Host port link LED
(1)Management port SPEED
(2) Management port LNK/ACT LED
(3)Maintenance port SPEED LED
(4) Maintenance port LNK/ACT LED
(11)Disk port link LED
(12)Disk port fault LED
(8)BBU LED
(7)ID LED
(6)Fault LED
(5)Ready LED
(A) FC 2-port controller
(10)Host port active LED
(9)Host port link LED
(B) FC 4-port controller
(9) Host port link LED
(10) Host port active LED
(C) 1G iSCSI 2-port controller
(10) Host port active LED
(9) Host port link LED
(D) 10G iSCSI 2-port controller

Figure 1-13: LED Display - Disk Array Controller (CONT)

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Management port/Maintenance port	Status
(2) Management port LINK/ACT LED (green) (4) Maintenance port LINK/ACT LED (green)	The LED is lit when it is connected. The LED flashes when data is transferred.
(1) Management port SPEED LED (green/orange) (3) Maintenance port SPEED LED (green/orange)	When operating at 100 Mbps: The LED lits in green. When operating at 1 Gbps: The LED lits in orange.

(5) Ready LED Green	(6) Fault LED Orange	(7) ID LED Blue	(8) BBU LED Orange	Status
Lit 1 second Not lit 1 second	Not lit	-	-	Running successfully.
Flashing fast	Not lit	-	-	Shutting down or backing up data in the memory.
Lit	Not lit	-	-	Starting up or rebooting.
Lit	Lit 1 second Not lit 1 second	-	-	Waiting for the disk enclosure behind the given enclosure to be powered on.
Lit	Lit	-	-	Failure has occurred.
Flashing fast	Lit	-	-	Failure has occurred (log collectable).
Lit 1 second Not lit 1 second	Lit	-	-	Retrying as disk enclosure shortage has been detected. Disk Port blocked.
Lit 1 second Not lit 1 second	Flashing fast	-	-	Updating firmware online.
-	-	Lit	-	The device is selected.
-	-	-	Lit	Detected BBU failure.
-	-	-	Flashing	Warning for the end of the BBU life cycle

Host port	Status
(9) Link LED (L) (green)	Lit = linkup Not lit = link down
(10) Active LED (A) (green)	Lit or flashing = I/O access
Link/Active flashing together	Flashing in a cycle of 2 seconds = Off line Flashing in a cycle of 1 second = Powering off Other than above = Invalid port settings

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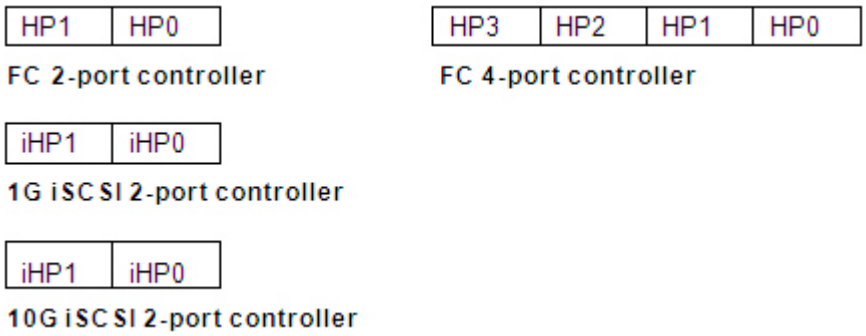

Figure 1-14: Location and Port Number

Disk port	Status
(11) Link LED (LNK) (Green)	Lit = linkup Not lit = link down
(12) Fault LED (FLT) (Orange)	Lit = An error is detected Not lit= Normal

Adapter (ADP)

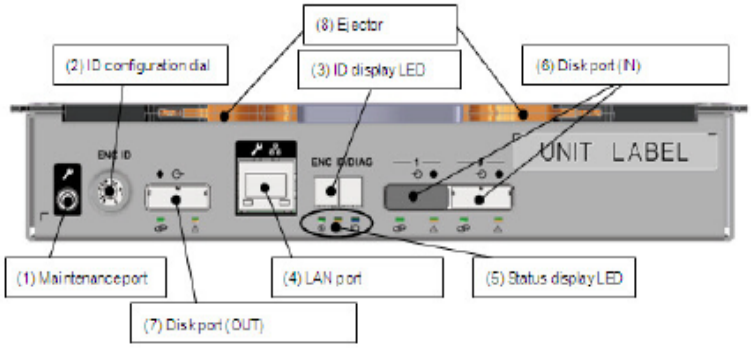

Figure 1-15: LED Display - Disk Array Enclosure Adapter

(1) Ready LED Green	(2) Fault LED Orange	(3) ID LED Blue	Status
Not lit	Not lit	-	Not connected or, not powered on.
Flashing	Not lit	-	Running successfully.
Flashing	Flashing in a cycle of 0.5 second	-	Initializing firmware.
Flashing	Flashing in a cycle of 1 second	-	Error between adapters has been detected.

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(1) Ready LED	(2) Fault LED	(3) ID LED	
Green	Orange	Blue	Status
Flashing	Lit	-	Error in the adapter has been detected. (Operation continued).
Not lit	Lit	-	Error in the adapter has been detected. (Unable to continue operation).
-	-	Lit	The device is selected.

Disk port	Status
(4) Link LED (LNK) (Green)	Lit = linkup Not lit = link down
(5) Fault LED (FLT) (Orange)	Lit = An error is detected Not lit= Normal

Figure 1-16: Location and Port Number - DP-OUT, DP-IN

NOTE: DP1-IN is not used under normal operation.

Basic Operation

Powering On the Disk Array System

AC Operating Mode

The disk array controller has a mechanism that powers the unit itself on automatically, not through operation of the power switch, according to power supply to AC.

AC operating mode is enabled in the factory default settings. AC operating mode can be disabled by issuing a certain command to the disk array controller. When AC operating mode is disabled, you need to use the power switch to control the power of the disk array controller.

When AC operating mode is disabled, the power control function through ESMPRO/AC is not available because the control circuits on the controllers are not powered on. Make sure to enable AC operating mode when you use the power control function through the ESMPRO/AC.

For information on how to change the factory default settings to disable AC operating mode, see *SnapSAN Manager Software Configuration Setting Tool User's Manual (GUI) for the SnapSAN 3000/5000*.

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Follow the steps below to power on the disk array system:

Step	Operation
0	Check the disk array controller and the disk enclosures are connected correctly. When AC power supplies are installed, check AC switches of the disk array controller and disk enclosures are set to off.
1	When AC power supplies are installed, set the AC switches to on, in the order of the disk enclosure and the disk array controller. When AC operating mode is enabled (factory default settings), the disk array system with AC power supplies is automatically powered on at the time the disk array controller is powered on while the disk array system with DC power supplies is automatically powered on at the time the power supply input cable is connected to the disk array controller or the disk array controller is powered on. Disk enclosures are sequentially powered on in association with the disk array controller. Proceed to step 3. If AC operating mode is disabled, proceed to step 2, otherwise proceed to step 3.
2	Step 2 should be performed only when AC operating mode is disabled. Press the DC button of a controller (CONT), which is located at the rear of the disk array controller, for approximately one second until fans start to rotate. The disk array controller will be powered on. The disk enclosures will be powered on sequentially as the disk array controller is powered on. Proceed to step 3. Press the DC button of either of the controllers (CONT). You do not need to press switches of both controllers
3	Do not operate the disk array system until the Power LED (green) located at the front of the disk array controller is lit and the Service LED (orange) goes off after cyclic flashing. • It takes approximately six (for minimum configuration) to eight (maximum configuration) minutes for initialization and the self test after the power on. During this period, the Service LED (orange) flashes cyclically. • If the Service LED (orange) does not go off and the Power LED (green) is not lit after 10 minutes (both LEDs are located at the front of the disk array controller), the disk array system may be failing. • See *Chapter 10, "Troubleshooting"* . • If the snapshot function or the data replication function is used, initialization and the self test described above take longer.
4	Power on the application servers (hosts). Make sure to power on the application servers after the disk array system is successfully started.

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Notes on Powering On the Disk Array System

1. When powered on from the battery backup status

   If the disk array system stopped due to an unexpected power outage, backed up cache data to the internal flash memory, and then restarted, high-speed writing by using cache (Cache Fast Write) will not be performed until charging the batteries used for the backup is complete, which makes performance of the disk array system degrade. This is because next backup is not guaranteed while batteries are not fully charged, and data is written to nonvolatile disk drives but not to caches that may get volatilized.

   It takes a maximum of eight hours to complete charging discharged batteries.

2. Restarting the disk array system after user data loss

   If a loss of data in caches has been experienced and then the disk array controller is powered on, the Service LED on the disk array controller repeats flashing for four seconds and then not lit for eight seconds. Follow the steps below to start the disk array system.

Step	Operation
1	Perform power off according to the steps in *Section : "Powering Off the Disk Array System"*.
2	Perform power on according to the steps in *Section : "Powering On the Disk Array System"*.
	• If the disk array system does not start up successfully, it may be failing. • Performance of the disk array system degrades until battery charging is complete, which takes a maximum of eight hours.

3. When the snapshot function is used:

   If the snapshot function is used, updated information is copied from disk drives to the cache memory when the disk array controller is started.

   Because of this, the disk array controller's start up time is delayed by 10 seconds per 1 TB of the updated information.

Power Control Systems without using Power Switches

Control systems described here are supported only in the SnapSAN 5000.

Control Systems

Table 1-12: About Control Systems describes power control systems that do not use power switches.

Control system	Host OS	Feature
ESMPRO/AC (Works together with UPS)	Windows Linux	This control system uses a server for power control, which can be associated with hosts. For details, see *ESMPRO/AC manual*.

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Control system	Host OS	Feature
ESMPRO/AC (Automatic operation)	Windows Linux	This control system uses a server for power control and allows for automatic operation. For details, see *ESMPRO/AC manual*.
UPS (Does not work with UPS)	Not specified	This control system is for instantaneous power interruption. Because there is no association, when the retention period of UPS elapses, temporary power-off followed by reboot takes place. Cached data, however, is protected.

Association is a mechanism to notify the disk array system of interruption of power supply to the UPS and to start shutdown.

If you use the UPS control system, establish redundancy by providing a UPS for each power supply of a device. Make sure that a failure of a single UPS does not cause simultaneous power failure of PS0 and PS1.

Notes on using a UPS and automatic operation

Where ESMPRO/AC association is used together with the disk array system, power must be turned off in a certain order.

AC power off sequence

1 Application server → 2 FC switch → 3 disk array controller → 4 Disk enclosure → 5 Management server (Only ESMPRO/AC)

If multiple disk enclosures are used, you do not need to specify the sequence of power off among the disk enclosures.

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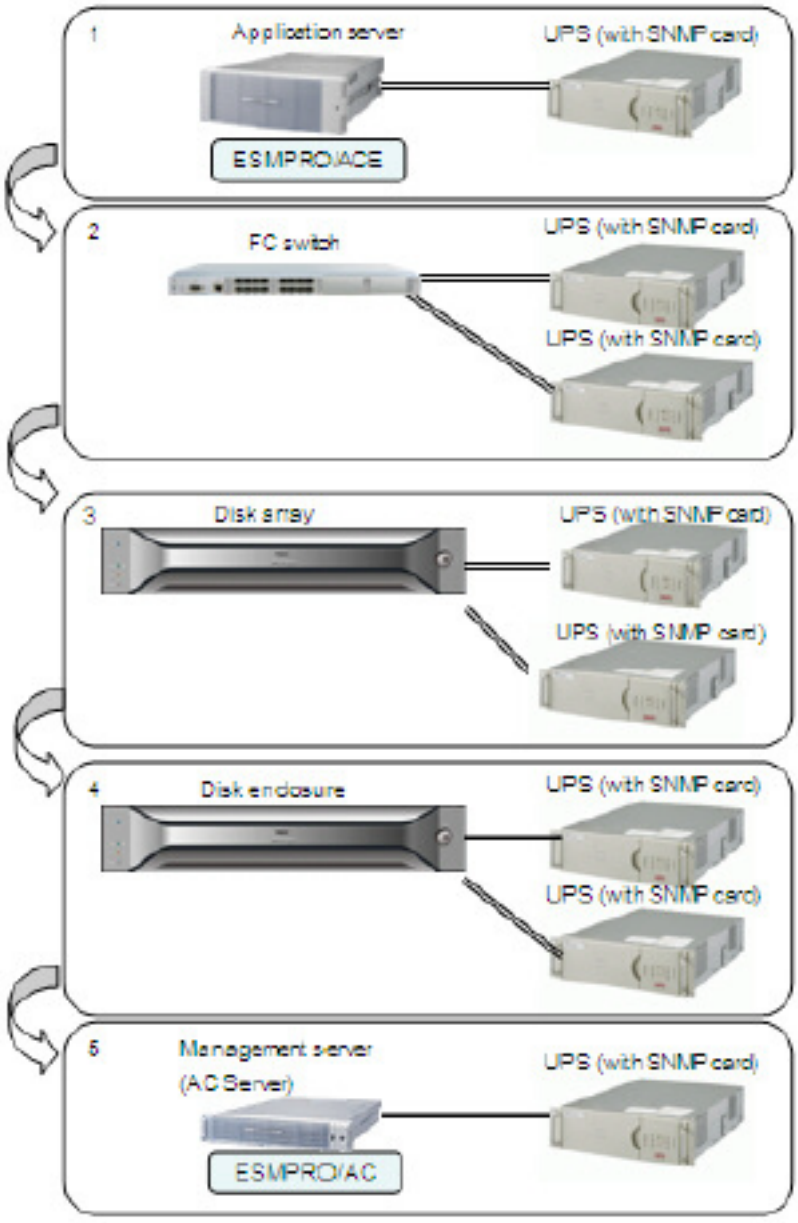

Figure 1-17: AC Power Off Sequence (FC Port Connection)

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Powering Off the Disk Array System

Follow the steps below to power off the disk array system:

Step	Operation
1	Stop or power off application servers (hosts). Make sure to check application servers (hosts) are stopped or powered off.
2	Press the DC button of a controller (CONT) located at the rear of the disk array controller. Then confirm that the Ready LED starts to flash rapidly. Press the DC button of either of the controllers (CONT). You do not need to press buttons of both controllers. If your press the DC buttons for 4 seconds or more, power is forcefully turned off, which may give negative impact on the disk array system.
3	Wait for the Power LED (green) located at the front of the disk array controller to go off. • With this process, the disk array controller writes data that is on caches and has not been written to disks to disks. • When writing the data is complete, the disk array system is automatically powered off. • If the Power LED (green) located at the front of the disk array controller does not go off after 10 minutes, the disk array system may be failing. • See *"Troubleshooting"* .
4	If necessary, turn off the AC switches of the power on the disk array controller and disk enclosures (only for those with AC power supplies). The power supply of the disk array system can now be stopped. Unlike power on, there is no rules for sequence of stopping.

Notes on Turning Off the AC Power

Backing up user data

If the power of this disk array system is turned off without going through the power off procedure described in *Section : "Powering Off the Disk Array System"*, or the power control systems without using DC buttons section described in *Section : "Powering On the Disk Array System",* the user data on caches will be backed up on the flash memory of the unit.

Data will not be lost even if the power is turned off without going through the procedures.

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Notes on using the data replication function

The update information (= storage system information) managed by the data replication function Volume Cloning or (Remote Replication) is created on a replication reserved volume or the cache memory.

If no replication reserved volume has been created, the update information mentioned above is created only on the cache memory. In these circumstances, even if the disk array system is powered off according to the procedure described in *Section : "Powering Off the Disk Array System"*, the status of the disk array system becomes backup status when the disk array system is stopped. If the backup fails, the storage system information is lost and the status of the disk array system becomes one of the following six statuses.

Activity	Synchronization	Pair Status
Separate	Separated	All spaces are different. There is no change in the status.
	Separating	The status becomes fault, where copying is stopped.
Replicate	Replicating	All spaces are different. Replication is automatically restarted from the beginning.
	Synchronized	There is no change in the status.
Restore	Restoring	The status becomes fault, where copying is stopped.
	Synchronized	All spaces are different. Replication is automatically restarted from the beginning.
		There is no change in the status.

For recovery of a pair whose status is fault, perform the following steps for replication.

a. Perform Forced Separate for the RV target.

b. Perform the steps to restore the previous status (Replicate → Separate, or Restore) again.

Copy is started again. All the spaces of logical disks are targeted, which means full copy is performed.

- When the replication function is used, it is strongly recommended that a user use the storage system information saving function and create a replication reserved volume by SnapSAN Manager. The capacity of the replication reserved volume will be 8.9 GB.
- Powering off by performing the ordinary steps backs up storage system information (differential map, etc.) in a replication reserved volume. If the disk array system is powered off while no replication reserved volume has been created, the state of the disk array system becomes backup. If no replication reserved volume is used, it is recommended to power on the unit 24 hours.

The storage system information saving function is a function to back up the storage system information such as differential map for business volumes (MV) and replication volumes (RV) to disk drives.

Auto Cache Flush Function

This is a function to automatically save user data, difference map, configuration information and the like on caches to disk drives when host IO is not issued for five minutes.

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If power off takes place without going through the ordinary procedure while data that has not been written is left on caches, the backup function works to protect the data on caches. However, because this backup function saves cached data in the flash memory by using batteries in the disk array system, the data may get lost if battery power is not sufficient and saving data fails.

Auto Cache Flush Function assures data on caches to be written to disk drives and prevents data loss even if a situation mentioned above arises.

Completion of Auto Cache Flush can be checked from high-speed flashing of POWER LED that flashes every 0.2 seconds.

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Chapter 2

Install SnapSAN Manager Suite

This chapter describes how to install the Network Setting Tool, install the SnapSAN Manager Agent Utility on the application servers, how SnapSAN Manager is provided, and how to start SnapSAN Manager Embedded.

How SnapSAN Manager is Configured

SnapSAN Manager, a disk array management software program, is provided in two types:

- SnapSAN Manager Embedded
  - SnapSAN Manager Embedded allows for configuring and managing only a single target disk array.
  - You can quickly start using SnapSAN Manager Embedded through a Web browser on a SnapSAN Manager Embedded machine with no management server needed.
- SnapSAN Manager
  - SnapSAN Manager allows for centralized configuration and management of multiple disk arrays by a single management server.
  - SnapSAN Manager also allows for integrated management of the entire system by working together with middleware products (such as WebSAM, ESMPRO, or SSC).

This document describes initialization and settings of a disk array using SnapSAN Manager Embedded. For information on initialization and settings of disk arrays using SnapSAN Manager, refer to the *SnapSAN Manager User's Manual*.

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The descriptions in the rest of this chapter are based on the recommended configuration example shown in Figure 2-1.

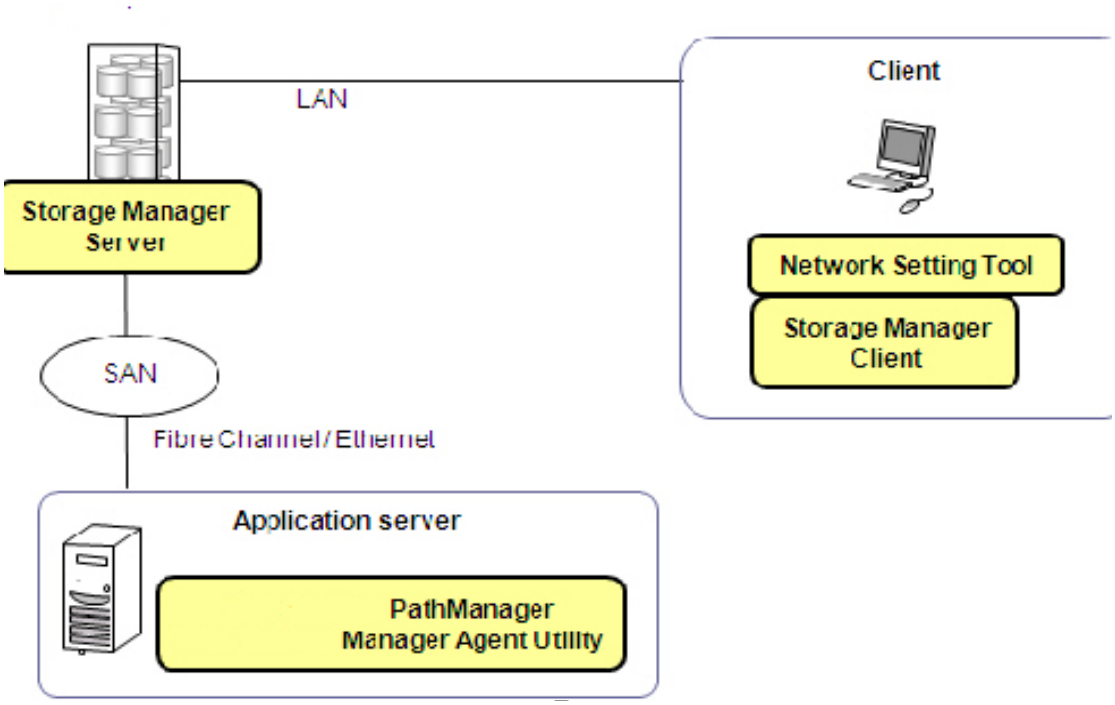

Figure 2-1: Example of Recommended Configuration

SnapSAN Manager Embedded Operating Environment

A Web browser and Java Runtime Environment (JRE) must be installed in the system before you start using SnapSAN Manager Embedded.

Table 2-1: Configuration Options

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Configuration	Description
Operating System	Microsoft Windows XP Professional Edition (from without any Service Pack to Service Pack 3) Microsoft Windows XP Professional x64 Edition (without any Service Pack and Service Pack 2) Microsoft Windows Vista Business (from without any Service Pack to Service Pack 2) Microsoft Windows 7 Ultimate (without any Service Pack and Service Pack 1) Microsoft Windows 7 Ultimate x64 (without any Service Pack and Service Pack 1) Microsoft Windows 7 Enterprise (without any Service Pack and Service Pack 1) Microsoft Windows 7 Enterprise x64 (without any Service Pack and Service Pack 1) Microsoft Windows 7 Professional (without any Service Pack and Service Pack 1)

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Configuration	Description
	Microsoft Windows 7 Professional x64 (without any Service Pack and Service Pack 1) Microsoft Windows Server 2003, Standard Edition (from without any Service Pack to Service Pack 2) Microsoft Windows Server 2003 R2, Standard Edition (without any Service Pack and Service Pack 2) Microsoft Windows Server 2003, Standard x64 Edition (without any Service Pack and Service Pack 2) Microsoft Windows Server 2003 R2, Standard x64 Edition (without any Service Pack and Service Pack 2) Microsoft Windows Server 2003, Enterprise Edition (from without any Service Pack to Service Pack 2) Microsoft Windows Server 2003 R2, Enterprise Edition (without any Service Pack and Service Pack 2) Microsoft Windows Server 2003, Enterprise x64 Edition (without any Service Pack and Service Pack 2) Microsoft Windows Server 2003 R2, Enterprise x64 Edition (without any Service Pack and Service Pack 2) Microsoft Windows Server 2008 Standard (without any Service Pack and Service Pack 2) (*) Microsoft Windows Server 2008 R2 Standard (without any Service Pack and Service Pack 1) (*) Microsoft Windows Server 2008 Enterprise (without any Service Pack and Service Pack 2) (*) Microsoft Windows Server 2008 R2 Enterprise (without any Service Pack and Service Pack 1)(*) Red Hat Enterprise Linux 5.5 to 5.7 (IA32/EM64T) Red Hat Enterprise Linux 5.5 to 5.7 Advanced Platform (IA32/EM64T) (*) Products without Hyper-V are also supported. The Server Core installation option is not supported.
Web Browser	**Windows** - Microsoft Internet Explorer Version 7 to 9 (32-bit versions) **NOTE:** For Windows Vista or Windows Server 2008, only Version 7 or later are supported. For Windows 7 and Windows Server 2008 R2, only Version 8 or later are supported. **Linux**: - Firefox 3.0, 3.5, and 3.6
Java Runtime Environment (JRE)	One of the following JREs (32 bit version) is necessary. From JRE 6 update 17 to JPE 29. See ***Table 4-2*** for information on combinations of supported JREs and OSes. When using Internet Explorer Version 9, be sure to use JRE 6 update 25 or later.
Memory	**Windows** - 67 MB or more. **Linux** - 70 MB or more.
Disk Capacity	No program needs to be installed. **NOTE:** A maximum of 30 MB is used for reporting log files.

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Configuration	Description
Display	XGA (resolution 1024 × 768) or greater

The information above is the supported operating environment for the default settings of SnapSAN Manager V7.4.

The following operating systems are supported under JRE6 (32 bit version) from JRE 6 update 17 to 29:

Operating Systems
Windows XP Professional Edition
Windows XP Professional x64 Edition
Windows Vista Business
Windows 7 Ultimate
Windows 7 Enterprise
Windows 7 Professional
Windows 7 Ultimate x64
Windows 7 Enterprise x64
Windows 7 Professional x64
Windows Server 2003, Standard Edition
Windows Server 2003 R2, Standard Edition
Windows Server 2003, Standard x64 Edition
Windows Server 2003 R2, Standard x64 Edition
Windows Server 2003, Enterprise Edition
Windows Server 2003 R2, Enterprise Edition
Windows Server 2003 Enterprise x64 Edition
Windows Server 2003 R2, Enterprise x64 Edition
Windows Server 2008 Standard
Windows Server 2008 R2 Standard
Windows Server 2008 Enterprise
Windows Server 2008 R2 Enterprise
Red Hat Enterprise Linux 5.5
Red Hat Enterprise Linux 5.5 Advanced Platform

IMPORTANT: Do not use any unsupported OS and JRE combinations.

When any product that uses Java Runtime Environment (JRE) is already installed in the environment where SnapSAN Manager Embedded (WebGUI) is used, the product and SnapSAN Manager Embedded can live together if the following condition is satisfied. If not, either SnapSAN Manager Embedded (WebGUI) or the product must be operated on another server or PC.

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The latest version of JRE installed in the environment supports SnapSAN Manager Embedded (WebGUI) as well as the product.

Use the JRE contained in the SnapSAN 3000/5000 Documentation Software CD for first installation. However, it is recommended to use the latest version among the supported JRE versions after the installation because the supported versions may include a version for which security vulnerability issue is reported.

For details about security vulnerability, see the following web pages:

- US-CERT (http://www.us-cert.gov)
- My Oracle Support (https://support.oracle.com/CSP/ui/flash.html)

Before Starting SnapSAN Manager Embedded

When you use SnapSAN Manager Embedded (Web GUI) in a Windows environment, configure the Web browser (Internet Explorer) as described below. Once the configuration is complete, you do no need to configure the Web browser in subsequent startups of SnapSAN Manager Embedded.

Follow the steps below to configure the disk array to be connected as Trusted Sites:

3. From Control Panel, select **Internet Options**, and click the **Security** tab.
4. Select the **Trusted sites** icon and click **Sites**.
5. Enter the URL of the disk array to be connected (for example, http://<the IP address (host name) of the disk array to be connected>) in the **Add this website to the zone** box, and click **Add**.

   The Require server verification (https:) for all sites in this zone check box should be cleared.
6. Click **OK** to close the window.

   NOTE: When you are using Internet Explorer Version 7 or later, do not enable Protected Mode of the Trusted sites.

When your environment is Windows, configure Java as well before you start using SnapSAN Manager Embedded (Web GUI). Once the configuration is complete, you do not need to configure Java again in subsequent startups of SnapSAN Manager Embedded.

Disable the auto update function of Java according to the following procedure:

1. Open the **Java Control Panel**.

   NOTE: In a Windows Vista or later environment or a Windows Server 2008 or later environment, right-click the icon to start the Web browser to select **Run as administrator**.
2. Use Explorer and execute the following **file** located in the JRE installation folder:
   - C:\Program Files\Java\jre6\bin\javacpl.exe
     (default installation in the 32 bit version OS)
   - C:\Program Files (x86)\Java\jre6\bin\javacpl.exe
     (default installation in the 64 bit version)

   IMPORTANT: Alternatively, when you are using a 32-bit version of OS and if Java is in Control Panel, you can use it.

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3. Click the **Update** tab and clear the **Check for Updates Automatically** check box.
4. Click **OK** to close the window.

Disable the next generation Java plug-in according to the following procedure. This example is based on Windows 7.

1. Open the **Java Control Panel**.

   NOTE: In a Windows Vista or later environment or a Windows Server 2008 or later environment, right-click the icon to start the Web browser to select Run as administrator.

2. Use Explorer and execute the following **file** located in the JRE installation folder:
   - C:\Program Files\Java\jre6\bin\javacpl.exe
     (default installation in the 32 bit version OS)
   - C:\Program Files (x86)\Java\jre6\bin\javacpl.exe
     (default installation in the 64 bit version)
3. Click the **Advanced** tab and clear the **Enable the next-generation Java Plug-in** (requires browser restart) check box.
4. Click **OK** to close the window.

Setup

Installing Network Setting Tool

This section describes how to install the Network Setting Tool.

Windows

Use SnapSAN Manager Setup to install Network Setting Tool.

For the SnapSAN 3000 disk arrays, SnapSAN Manager Setup is started automatically when the SnapSAN 3000/5000 Documentation Software CD is set. For the SnapSAN 5000 disk arrays, it is necessary to prepare the Overland Storage Base Product. Follow the instruction on the screen to complete the installation.

Follow the steps below to use SnapSAN Manager Setup:

1. Log in as **Administrator**.
2. Set the SnapSAN 3000/5000 Documentation Software CD in the CD-ROM drive of the SnapSAN Manager Embedded.

   SnapSAN Manager Setup should automatically start.
3. Follow the **instructions** on the screen to perform the installation.

   SnapSAN Manager Setup may not automatically start in some environments, in which case you need to go to \INSTALL\WINDOWS\ISMSETUP.EXE, select Setup for SnapSAN 3000/5000, and then click Next.
4. Select **Setup as a disk array** in Quick Install, and then click **Next**.
5. Check the **software** to be installed, and click **Next**.
6. Make sure to read all of the **software license agreement**.

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- If you **accept** the agreement select I accept terms of the license agreement and then click **Next**.
- If you **do not accept** the agreement, you cannot use the software.

7. To install the software in the shown destination, click **Next**.

   If you want to install the software in a folder other than the shown destination, click Browse to select the folder you want to use.

8. Install the software as you are prompted by the **instructions**.

If you install JRE in this step, perform the JRE preparation.

NOTE: The installer will search for JRE. If not found you have an option to install JRE 6u18 if found, you have an option to install this version or use the version currently installed on the server.

9. Click **Next** to start Network Setting Tool.
10. Proceed to **configuration of IP addresses** of the disk array.

    NOTE: See Section "Configuring IP Addresses by Using Network Setting Tool".

    Configure the IP addresses of the disk array during the installation. The IP addresses consist of the IP addresses of controllers, BMC addresses of controllers and a floating address. If SnapSAN Manager Embedded is used, an IP address should be set to each of controllers.

    NOTE: NOTE:When the installation is started from by selecting Setup for SnapSAN 3000/5000 in SnapSAN Manager Setup, JRE and .NET Framework, which are necessary for Network Setting Tool and SnapSAN Manager Embedded (Web GUI), must be installed.

Linux

Follow the steps below to install Network Setting Tool.

- For SnapSAN 3000 disk arrays, use the SnapSAN 3000/5000 Documentation Software CD that comes with the disk array.
- For the SnapSAN 5000 disk arrays, it is necessary to prepare Overland Storage Base Product.

1. Log in as **root user**.
2. Set the SnapSAN 3000/5000 Documentation Software CD in the CD-ROM drive of the SnapSAN Manager Embedded.

   If you cannot use the CD-ROM in your environment, send the iSMnetconfig.rpm file from another server.

3. Mount the **CD-ROM**:

   a. Create a **mount directory** (Example: /cdrom)

   b. Use the **mount command**:

   ```
   mount -r /dev/cdrom /cdrom
   ```

4. Install **JRE**.

   NOTE: If it is already installed on your machine, the installation is not necessary.

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- Copy the installer to a directory you want to use (for example, /tmp):
  cp -r /cdrom/JRE/LINUX/jre-6u21-linux-i586-rpm.bin /tmp/.
- Run the installer you have copied:
  /tmp/ jre-6u21-linux-i586-rpm.bin

5. Use the rpm command for the installation:
   rpm -ivh /cdrom/NETCONFIG/LINUX/iSMnetconfig.rpm
   The message "Installation of iSMnetconfig was successful" is shown when the installation is complete.
6. Unmount the CD-ROM using the unmount command (umount /cdrom).
7. Register **JRE** with the Web browser (Firefox) according to the following procedure:
   a. Exit **Firefox**.
   b. If any JREs have been **registered** with the plugins directory of Firefox, delete them.
      You cannot register JRE of different versions at a time.
   c. Remove the symbolic links **javaplugin-oji.so** and **libnpjp2.so** from /usr/lib/firefox-<version>/plugins (for the default settings).
   d. Create a **symbolic link** to JRE in the plugins directory of Firefox.
   e. Run the following **command** with the /usr/lib/firefox-<version>/plugins (for the default settings) as a current directory:
      - **Firefox 3.5 or earlier**:
        ln -s usr/java/jre<version>/plugin/i386/ns7/libjavaplugin_oji.so
      - **Firefox 3.6 or later**
        ln -s usr/java/jre<version>/lib/i386/libnpjp2.so

Note the following when you connect a disk array for which the network settings have not been configured:

NOTE: The disk array must be connected to the SnapSAN Manager Embedded machine over a LAN to execute Network Setting Tool.

- The IP addresses, BMC addresses and a floating address of the disk array are 0.0.0.0 by default.
- Connect the disk array to physically the same network where the SnapSAN Manager Embedded machine belongs (for example, a network that is not beyond a router).

IMPORTANT: User Datagram Protocol (UDP) and port number 2730 are used for searching disk arrays. If any firewall is set, configure the settings of the network for the SnapSAN Manager Embedded machine and the disk array to allow packets for search to pass.

Configuring IP Addresses by Using Network Setting Tool

Network addresses are set to a disk array for monitoring from SnapSAN Manager.

After connecting the disk array (device) to physically the same network where the machine on which Network Setting Tool has been installed (i.e. the network not beyond a router), configure IP addresses having the same segment as the machine on which Network Setting Tool has been installed by referring to the example shown below.

For example:

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The address of the machine on which Network Setting Tool is installed is 192.168.0.20/24.

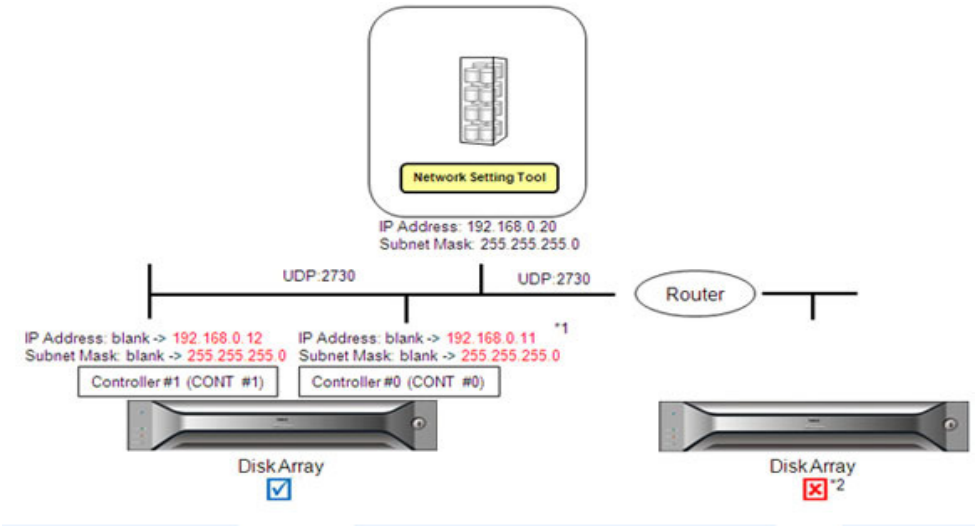

Figure 2-2: Connect Disk Array - Example

NOTE: IP addresses have the same segment as the machine on which Network Setting Tool has been installed.

When the disk array and the SnapSAN Manager Client are operated on different segments, configure IP addresses by referring to the example shown above and then move the disk array. When you move the disk array, make sure to remember the gateway address settings.

Configuration

In a Windows environment, the Network Setting Tool is automatically started after Network Setting Tool is installed by using SnapSAN Manager Setup.

To configure manually, click Start > All Programs > SnapSAN Manager Network Initialization Tool > Network Setting Tool to run Network Setting Tool.

In a Linux environment:

1. Run the **iSMinitool** command.
2. Click **Refresh** when Network Setting Tool is started.

   Disk arrays detected through search are displayed and “not set” is shown for Status for disk arrays for which network settings will be performed for the first time.
3. Select the target disk array from the list and click **Set**.
4. If the SnapSAN 3000/5000 has been installed and IP addresses have been configured, “finished” is shown in the Status column.

   For details about information shown for the Status column, see Table 2-1.

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Table 2-2: Initialization Status of Disk Array

Status	Description
Displayed information	Disk array status.
not set	Disk array has just been installed. The disk array is not monitored by SnapSAN Manager because the network settings have not been done. IP addresses must be configured by using Network Setting Tool.
finished	IP addresses have been configured. The disk array can be monitored by SnapSAN Manager.

5. Configure the **network addresses** to allow monitoring the disk array by SnapSAN Manager.
6. Configure a **floating address** for the disk array, and configure the network address, BMC address, and floating address for each of disk array controllers.

   When the settings are configured for a controller not connected by a LAN cable, monitoring is disabled.
7. Check that the disk array is **connected** to the SnapSAN Manager Embedded over the LAN and then specify an IP address, a subnet mask, a gateway address, a BMC address, a BMC subnet mask, and a BMC gateway address for each of the controllers.

   IP addresses from 10.1.0.0 through 10.1.0.255 (subnet mask 255.255.255.0) and from 10.2.0.0 through 10.2.0.255 (subnet mask 255.255.255.0) and 0.0.0.0 are reserved. These IP addresses and subnet mask can not be specified. Specify IP addresses for the controller other than these IP addresses and that allow communication with the SnapSAN Manager Embedded. If no gateway address is specified, enter 0.0.0.0.
8. Enter the floating address:

   Floating address is an IP address that can be set to a disk array in addition to the network addresses configured for each controller.

   Setting a floating address allows you to access a disk array while controllers remain transparent.

   It is recommended to configure a floating address for ease of management. When a floating address is specified, the following conditions must be satisfied for network addresses of controllers and the floating address:

   - IP addresses of Controller 0 and Controller 1 belong to the same segment and an unused IP address of the same segment as the controllers is assigned to the floating address.
   - IP addresses of Controller 0 and Controller 1 belong to different segments and an IP address that does not belong to those segments and does not have any conflict with other existing segments is assigned to the floating address.
9. When all the required information is entered, click **Set**.

   The dialog box for confirmation is displayed.
10. Click **Set** again to set the specified values to the disk array.

    Click Cancel to change the settings.

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CAUTION: If any IP address, subnet mask, or gateway address is not configured correctly, configuring the network settings fails. As a result, monitoring by using SnapSAN Manager is not enabled.

NOTE: If the error message "The setting of IP address failed." is shown, refer to the help of Network Setting Tool.

Setting a Time Zone of the Disk Array

Windows

Use SnapSAN Manager Setup to configure the time zone settings. SnapSAN Manager Setup is automatically started when you insert the SnapSAN 3000/5000 Documentation Software CD and it allows you to perform the settings as prompted.

NOTE: Depending on your environment, the program may not start automatically, in which case you need to launch \INSTALL\WINDOWS\ISMSETUP.EXE2 and follow the steps below.

After you configure IP addresses as described in ***Section : "Configuring IP Addresses by Using Network Setting Tool"***, the page to set a time zone appears.

1. Select **Setup for SnapSAN 3000/5000** and click **Next**.
   The Select Installation Method page appears.
2. To set a time zone, select **Yes** and click **Next**.
   By default, Asia and (GMT +9) Tokyo time zone is set. If you want to skip the setting, select No.
   When you select Yes, the following page appears.
3. Select the **Time Zone** and click **Set Time Zone**.
4. Click **Next**.
5. Click **Finish** on the setup completion page.
   The Web browser is started.

Linux

Follow the steps below and use the time zone setting command to set a time zone of the disk array.

1. Log in as **root user**.
2. Set the SnapSAN Manager Embedded Setup and Utility CD in the CD-ROM drive of the SnapSAN Manager Embedded.
3. Mount the **CD-ROM**:
   a. Create a **mount directory** (Example: /cdrom)
   b. Use the **mount command**:

```
mount -r /dev/cdrom /cdrom
```

4. Run the time zone setting command (**iSMtzconfig**) to obtain the time zone, then run **TZCONFIG/LINUX/iSMtzconfig** in the CD-ROM for the time setting command:

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```
# /tmp/TZCONFIG/LINUX/iSMtzconfig show

Serial Number          Time Zone information
0000000991050240       Asia/Tokyo        (GMT+9)
iSMtzconfig: 001 Command has completed
successfully.
```

5. Check the **result** of running the command.

   Confirm that the message number **001** is reported and the time zone of the disk array is shown after running the time setting command.

6. To change the time zone, run the time setting command.

```
# /tmp/TZCONFIG/LINUX/iSMtzconfig set -serial
0000000991050240 -zone Asia/Tokyo -reboot
Serial Number          Time Zone information
0000000991050240       Asia/Tokyo        (GMT+9)
iSMtzconfig: 001 Command has completed
successfully.
```

7. Check the **result** of running the command.

   Confirm that the message number **001** is reported and the time zone of the disk array is shown after running the time setting command.

> **CAUTION:** When you complete setting a time zone, the disk array is restarted. Before you start setting a time zone, check that it does adversely affect your operations.

When using Red Hat Enterprise Linux Version 6 in an EM64T server environment, the following packages must be installed in advance:

- glibc-XXXX.i686.rpm
- nss-softokn-freebl-XXXX.i686.rpm.

Where XXXX indicates the version of the package. These packages are included in the OS installation media.

Installing SnapSAN Manager Agent Utility on Application Server

This section describes how to install the SnapSAN Manager Agent Utility on an application server. For details about the installation procedure, see either of the following depending on the platform of the application server.

- For Windows application servers, see *"Installing SnapSAN Manager Agent Utility"*.
- For Linux application servers, see *"Installing SnapSAN Manager Agent Utility"*.

Starting SnapSAN Manager Embedded

> **NOTE:** Before you use SnapSAN Manager Embedded (Web GUI) in a Windows environment, configure the Web browser (Internet Explorer) and Java.

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1. Start your **Web browser**.

   In a Windows Vista or later or Windows Server 2008 or later environment, right-click the icon to start the Web browser to select Run as administrator.

2. Start up the **SnapSAN Manager Embedded** by entering the host name or the IP address (floating address, or if no floating address is assigned, the IP address of Controller 0 or Controller 1) of the disk array to be connected in the address bar of the Web browser.

   For example, http://host name (or http://IP address).

CAUTION: If you enter the IP address in the IPv6 format, the IP address must be enclosed in square brackets [ ], in which case, you cannot use Internet Explorer 6. If only the SnapSAN is configured for IPV6, then avoid IE6. If using IPV4, there are no changes.requried.

Parameter	Description
User Name	Allows to enter user name.
Save User Name	Allows to save the entered user name.
Password	Allows to enter a password.
Save Password	Allows to save the entered password.

3. Perform the following steps to **logon** to SnapSAN Manager Embedded:

   a. Enter **sysadmin** in the User Name box.

   b. Enter **sys123** (default value) in the Password box.

IMPORTANT: Saving the user name and/or the password can lead to allowing access to anyone.

4. Click **Options**.

The login window is expanded as shown which allows you to configure the behavior after login.

NOTE: For details, see SnapSAN Manager User's Manual.

Parameter	Description
Save Messages to a Log File	Allows to saves messages to a log file
Display Maintenance Status	If this option is selected, an error/warning in underlying component will be escalated to higher layer even if there is no affect to the operation.
Logical Disk View Order	Select Number to view the logical disks sorted in logical disk number order. Select Name (OS + Logical Disk Name) to view the logical disks sorted in OS Type and logical disk name order.

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5. Click **Login** to open the main screen.

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Chapter 3

Initializing an FC Disk Array

Overview

This chapter describes how to initialize a disk array configured for Fibre Channel (FC) connections.To set FC connection first in a disk array configured for both FC and iSCSI connections, do the procedure in this chapter and then see *"Initializing a Disk Array (iSCSI)"* to make the settings.To set iSCSI connection first, see *"Initializing a Disk Array (iSCSI)"* to make settings and then do the procedure in this chapter.

The initialization consists of:

1. **Collecting host information**
   - Collect host information from the application server.
   - For details about the procedure, see *"Collecting Host Information From Application Servers"*.
2. **Initializing the disk array by using the initialization wizard**
   - Use the initialization wizard to make the basic settings of the disk array.
   - For details about the procedure, see *"Initialization Wizard"*.
3. **Binding a pool**
   - Bind a pool in the disk array.
   - For details about the procedure, see *"Binding a Pool"*.
4. **Binding a hot spare**
   - Bind a hot spare. This step is not required unless a hot spare is bound.
   - For details about the procedure, see *"Binding a Hot Spare"*.
5. **Binding logical disks**
   - Bind logical disks.
   - For details about the procedure, see *"Binding Logical Disks"*.
6. **Collection and registration of host information**
   - Collect host information and register it with the disk array.
   - For details about the procedure, see *"Collecting Host Information"*
7. **Assigning the logical disks to the application servers**
   - Assign the created logical disk to the application servers.
   - For details about the procedure, see *"Assigning Logical Disks"*.
8. **Checking connection from the application servers**
   - Check that the application server to which the logical disks have been assigned can access the disk array.
   - For details about the procedure, see *"Checking Connection from Application Servers"*.

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Collecting Host Information

This section describes collection of host information from application servers.

Host information can be automatically collected if the OS used on the application servers is only Windows and servers used in the system are all new (servers that have not begun operating).

When there is any Linux (RHEL5 or later or SLES10 or later) application server and the servers used in the system are all new (servers that have not begun operating), host information can be collected through the disk array.

To collect host information when the disk array is installed in a system that has already begun operating or there is any application server on a different operating system, see *Section B.2.1: "Collecting Host Information by Using File Output"* for a Windows environment, or *Section D.2.1: "Collecting Host Information by Using File Output"* for a Linux environment.

Collecting Host Information Automatically or through a Disk Array

When the OS of new servers to be connected by SAS cables is Windows and a disk array is newly installed, host information can be automatically collected by using the SnapSAN Manager Host Agent Service function and SAS connection paths between the disk array and Windows servers.

When the OS of new servers to be connected by FC cables is Linux (RHEL5 or later or SLES10 or later) and a disk array is newly installed, host information can be collected through the disk array.

For details about the setting, see *Section 5.3.5: "Collecting Host Information"*.

To collect host information without connecting FC cables in one of the configurations above, see Section B.2.1: "Collecting Host Information by Using File Output" for a Windows environment, or Section D.2.1: "Collecting Host Information by Using File Output" for a Linux environment.

Collecting Host Information by using the Host Information Collection Command

When a disk array is installed in a system that has already begun operating or any of the application servers to be connected by FC cables is on an OS other than Windows or Linux (RHEL5 or later or SLES10 or later), use the host information collection command to report files. Registering the reported files allows assigning the application server to created logical disks. For details about how to register reported files, see *Section B.2.2: "Registering Host Information by Using File Output"* for a Windows environment, or *Section D.2.2: "Registering Host Information by Using File Output"* for a Linux environment.

- To make settings for collecting host information automatically or through a disk array, see *Section 5.3.5: "Collecting Host Information"*.
- For details about how to collect host information, see one of the following depending on the platform of the application server:
  - For a Windows application server, see *Section B.2: "Collecting/Registering Host Information on Application Server (Windows)"*.
  - For a Linux application server, see *Section D.2: "Collecting/Registering Host Information on Application Server (Linux)"*.

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Initialization by SnapSAN Manager Initialization Wizard

Overview

Use the initialization wizard to make the basic settings of a disk array.

Operations to be performed on the initialization wizard are:

- Set the disk array subsystem name
- Change and/or confirm a disk array name.
- Set time
- Set time by configuring the NTP server, or manually.
- Host connection port parameters (FC)
- Set the host connection port.
- Port mode switching
- Change the port mode.

Starting the Initialization Wizard

1. Click **Configuration** and **Initialization** on the left pane to open the menu.
2. Then click **Start** to start the initialization wizard.

Before the initialization starts, the following confirmation message appears.

3. Click **Yes** to start the initialization wizard.

Welcome to Initialization Wizard

When the initialization wizard starts, perform the settings as prompted.

1. Select the setting type for initialization.
   The sections below explain how to make normal setting.

IMPORTANT: To perform quick setting, see *Configuration Setting Tool User's Manual (GUI) for the SnapSAN 3000/5000*.

2. Confirm whether Normal Setting is selected, and then click **Next**.

NOTE: Quick Setting cannot be used: for the disk arrays of the SnapSAN 5000 or later; when Access Control is enabled and; if unused physical disk are different in type, capacity or rotation speed.

Set Disk Array Subsystem Name

You can change the disk array name.

Parameter	Description
Product ID	Displays the product ID of the disk array.
Serial Number	Displays the serial number of the disk array.

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Parameter	Description
Disk Array Subsystem Name	Displays a name to identify the disk array subsystem.
New Disk Array Subsystem Name	By default, displays the current disk array subsystem name. To change this name, enter a new disk array subsystem name.

Perform the following steps to change a disk array name:

1. Enter a new name in the **New Disk Array Subsystem Name** box.
2. Confirm the name and click **Next**.

Set Time

Figure 3-1:

Parameter	Description
State	Displays the date and time currently set for the disk array and the status of synchronization with the NTP server appear.
Synchronize the time with the NTP server.	Select this option to move on to the NTP setting page.
Set the time manually.	Select this option to move on to the manual time setting page.
Don't set the time now.	Select this option to move on to the step to unlock license without setting time.

To configure a time using NTP, select **Synchronize the time with the NTP server** and click **Next**.

3. Configure the NTP settings.

Parameter	Description
IP Address	Specify an IP address of the NTP server.

4. To set NTP server, enter the required information and click **Next**.

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Host Connection Port Parameters

Set the host connection port for the disk array supporting FC.

This screen is displayed only for disk arrays of the SnapSAN 5000 or later.

Parameter	Description
Port list	Select the port you want to set.
Edit button	A dialog box is displayed that lets you edit the settings of the selected port.

5. Edit dialo

Parameter	Description
Port number	Unique port number.
Port name	Specify the name to be assigned to the port.
Platform	Specify the platform of the host to be connected.
Data rate	Specify the value corresponding to the data transfer rate of the HBA or HUB.
Server connection type	Specify the connection topology between the disk array and the host. Automatic negotiation: The connection type is automatically negotiated. FC-AL: Select this when connecting the host connection port and the application server directly over an FC cable or when using a loop topology FC switch. FC switch connection (Fabric): Select this when using an FC switch other than a loop topology FC switch.
Switch ID	Specify the value of the switch for the port. The specifiable value range is 00h to 7dh. When connecting multiple disk arrays in a loop topology FC switch configuration, make sure that the value of each switch is unique.
Port type	Select the port type. Select the host port or data migration port. This setting is displayed only when the data migration function is usable.

6. Clicking **OK** applies the change of settings to the list.
7. When you click **Next** after changing the port settings as needed, the port settings are made.

Port Mode Switching

You can change the FC port mode of the disk array. This screen is displayed only for disk arrays of the SnapSAN 5000 or later.

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1. Port List view:
   - The Port List view lets you check the information about the disk array ports.
   - A port number is expressed in the format of "director number-port number".
   - The following items are displayed.
     - Port Number
     - Port Name
   - Mode
     - WWN: Port in the WWN mode
     - Port: Port in the Port mode.
   - Configuration lock
     - Lock: Locked port
     - (Empty): Port not locked
   - Unselectable Reason
     - The following items are hidden by default.
   - Host
     - To display any of these items, right-click the item name and set **Display** for the relevant item.
2. WWN Mode and Port Mode radio buttons:
   - WWN Mode: Changes the mode of the port to the WWN mode.
   - Port Mode: Changes the mode of the port to the port mode.
3. Change All button.

   If you click this button, all the ports are changed to the mode selected with **WWN Mode** or **Port Mode**. In this case, you do not need to select a port from the port list. However, you cannot change the mode by using this button if there are any ports locked by the port configuration lock/unlock function. You cannot change to the port mode if the configuration lock function confirms that any target application server is in operation. Stop all the target application servers before performing this operation.
4. Change Selected button.

   If you select a port and then click this button, the selected port is changed to the mode selected with **WWN Mode** or **Port Mode**. You can select multiple ports in the port list if they are in the same mode. When a confirmation screen is displayed for checking the settings in advance, check the current mode of the port and the mode you are changing to. However, you cannot change the mode of a port locked by the port configuration lock/unlock function. You cannot change to the port mode if the configuration lock function confirms that any target application server is in operation. Stop all the target application servers before performing this operation.

Finish Initialization Wizard

5. Confirm the initialization is finished.

Bind Pool

When you click this hyperlink, the **Pool Bind** page appears for starting pool binding.

Initialization Wizard

6. To move on to pool binding, click **Bind pool**.

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CAUTION: When the initialization is complete, the Access Control function starts automatically.

Binding a Pool

Perform basic settings for binding a pool.

Parameter	Description
Show pool list	Click Show pool list to see the list of existing pools. Click Close pool list to hide the pool list.
Physical disk type	Select the type of physical disks that configure a pool.
RAID type	Select the RAID type of the pool.
Auto disk selection	Specify the number of physical disks to be used from the **Number of physical disks** and the capacity per physical disk from **Physical disk capacity**. The selectable numbers of physical disks are: RAID6(4+PQ): 6 disks or more RAID6(8+PQ): 10 disks or more RAID5(2+P): 3 disks or more RAID5(4+P): 5 disks or more RAID5(8+P): 9 disks or more RAID-TM: 3 disks or more RAID1: 2 disks or more
Manual disk selection	Select this option and click **Select physical disks** to manually select physical disks to be used for a pool.
Calculate pool capacity	Click this button to see an estimated capacity of a pool in **Total capacity of the pool**. When **Physical disk type**, **RAID type**, **Number of physical disks**, **Physical disk capacity** is changed, there is possibility that “calculating” is displayed temporarily under **Total capacity of the pool.**

Perform the following steps to bind a pool:

1. Select the type of physical disk from **Physical disk type**.
2. Select the type of RAID from the **RAID type** drop-down list menu.
3. Select the number of physical disk that configure the pool and their capacity using either **Auto disk selection** option or **Manual disk selection** option.

CAUTION: When 61 or more physical disks configure a pool, pool expansion is automatically performed. The value for **Total capacity of the pool** displayed for a pool configuration with 61 or more physical disks is rough estimate.

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4. Click **Next** to move on to the step for checking settings.

The page for confirming the settings of pool binding appears. This page lists the settings of the pool to be bound.

Parameter	Description
Basic Settings	Displays basic settings to be used for binding a pool.
Advanced Settings	Displays default advanced settings to be used for binding a pool.
Advanced	Click **Advanced** to modify the default settings displayed under **Advanced Settings**.
Physical disks to configure the pool	Displays details of physical disks used to configure a pool.

5. Check if the list has any problems. If the list has no problems, click **Set** to display the confirmation message
6. Click **Yes** to perform pool binding. When the binding is completed, the completion window appears.

CAUTION: When a physical disk to be used is stopped with the power saving function on, it takes time to bind the pool.When the first pool is bound, a system value (8GB) is automatically created.

When the pool binding is successfully completed, the result of pool binding appears.

n

Parameter	Description
Bind another pool	Click this hyperlink to reopen the **Pool Bind** page to bind another pool.
Bind hot spare	Click this hyperlink to open the **Hot Spare Bind** page.
Bind logical disk	Click this hyperlink to open the **Logical Disk Bind** page.

Perform one of the following steps:

- Click **Bind hot spare** to bind hot spare.
- If you do not want to bind hot spare, click **Bind logical disk** to move on to logical disk binding.

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Binding a Hot Spare

This section explains how to bind a hot spare.

The **Hot Spare Bind** page has the view display and the list display. The displays can be switched by clicking the tabs.

Parameter	Description
List	By default, the List view is displayed. The List view displays a list of physical disks available to bind a spare. Select the specified check box of the physical disk for which hot spare will be bound.
View	Click this tab for the visual display of physical disks available to bind a spare. Select the specified check box of the physical disk for which hot spare will be bound.
Pool list	Select a physical disk to create a hot spare. When you select the physical disk for hot spare binding, Enabled is displayed under the **Enable Hot Spare** field of the Pool list. Pools that are enabled by a newly bound hot spare are shown in bold.
Enable the copy back mode	Select this option to enable copy back mode. When a faulty disk is replaced by a new disk, copy back mode automatically copies back the data to the new disk.

Perform the following steps to bind a hot spare:

1. Select one or more **physical disks** for hot spare binding.
   When you select the physical disks, pools with Enable Hot Spare are displayed in bold letters.

CAUTION: For slots having no physical disks, the slot names and check boxes are grayed out in the view display, and the slots are not listed in the list display. For physical disks for which a pool has been bound, the check boxes are grayed out in the view display, and the disks are not listed in the list display.

2. Click **Set** to display the following confirmation message.
3. Click **Yes** to perform hot spare binding.

When the hot spare binding is completed, the result dialog box appears.

Parameter	Description
Bind another hot spare	Click this hyperlink to reopen the **Hot Spare Bind** page to bind another hot spare.

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Parameter	Description
Bind pool	Click this hyperlink to open the **Pool Bind** page to bind another pool.
Bind logical disk	Click this hyperlink to open the **Logical Disk Bind** page.

Binding Logical Disks

This section explains how to bind logical disks.

Perform the following steps for binding a logical disk.

Parameter	Description
Pool information	Displays pool information.
Basic logical disk settings	Displays the basic settings to be used for binding logical disks.
Logical Disk Advanced Settings	Displays default advanced settings to be used for binding a logical disk.
Advanced	Click **Advanced** to modify the default settings displayed under **Logical disk advanced settings**.
Logical disks to be bound	Displays the details of the logical disks to be bound.

1. Verify the **settings** of the logical disk to be bound that are listed.
2. To perform advanced settings, click **Advanced**.
3. After confirming the settings, click **Set** to display the following confirmation message.

The result of the logical disk binding appears

.

Parameter	Description
Bind another logical disk	Click this hyperlink to reopen the **Logical Disk Bind** page for another logical disk binding.
Set the host to which logical disks will be assigned	Click this hyperlink, to open the **Host Information Collection** page.
Assign logical disks to the host	Click this hyperlink to open the **Assignment of Logical Disk** page.

4. Click **Set the host to which logical disks will be assigned** to retrieve the information of the host to which logical disks that have been bound are assigned. Select how to collect host information.

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Parameter	Description
Collect host information automatically (Windows, Linux or Hyper-V).	Select this option to retrieve host information automatically by showing the volume for information retrieval to all hosts.
Update with host information file.(Windows, Linux or Hyper-V)	Select this option to configure host information by using the files for host information retrieved on application servers.
Create host information manually. (Windows, Linux, VMware or Hyper-V)	Select this option by manually entering interfaces with hosts, host names, platforms, WWPNs, and port numbers to configure host information.

5. Select **Collect host information automatically (Windows or Linux)** and click **Next**. The confirmation dialog box appears.
6. Click **Yes**. The **Host Information Collection - Registration** screen appears.

Parameter	Description
Show collected information	Click this button to retrieve the host information collected by the disk array controller.

7. Confirm whether the information on all the hosts is retrieved, and then click **Yes**.

On Windows, it may take a few minutes to retrieve information. Wait for a few minutes before clicking **Show collected information**.

On Linux, This chapter describes how to initialize a disk array configured for Fibre Channel (FC) connections.

This chapter describes how to initialize a disk array configured for Fibre Channel (FC) connections.

CAUTION: run the command to register the host information on hosts before clicking **Show collected information**.

Depending on connected switches or HBA settings of hosts, link up may fail or take time, which result in failure of host information retrieval. For more details, see *Section 10.1: "Troubleshooting According to Device Conditions"*.The result of the logical-disk binding appears.

Parameter	Description
Assign logical disks to the host	Click this hyperlink to assign the bound logical disks to hosts whose information has been retrieved.

Assignment of Logical Disks

Assign logical disks to hosts.

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Parameter	Description
Host List	Displays hosts registered with the disk array. Click a host to which you want to assign logical disks.
Register information of a host	Click this hyperlink if you cannot find the target host listed in the **Host list** and want to jump to the **Host Information Collection** page.
Show all assignable logical disks	Select this check box to display all logical disks that can be assigned.
Select drop-down list	Select the logical disk list display type from the drop-down list.
LD List	Displays the list of logical disks bound in the disk array. Click a logical disk you want to assign.

CAUTION: The display items can be sorted, however, the order cannot be changed.

Multiple logical disks can be selected at the same time.

Perform the following steps:

1. Select hosts from the **Host List** to which logical disks will be assigned.
2. Select logical disks from the **LD List** to which hosts will be assigned.
3. Click **Next**.

Parameter	Description
Host List	Displays the hosts to which logical disks will be assigned.
LDs Assignable to Host	Displays logical disks to be assigned to the host.
Change LUN	Click this button to open the LUN Settings page, which allows configuring LUN (Logical Unit Number) setting.

4. Check the setting and click **Set** to perform the logical disk assignation. When the assignation is completed, the completion page appears.

Assignment of Logical Disk - Finish

Parameter	Description
Assign logical disks to another host	Click this hyperlink to assign another logical disk to the host.
Register information of a host	Click this hyperlink to open the **Host Information Collection** page.

5. Click **Finish**.Multiple logical disks can be selected at the same time.

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Checking Connection from Application Servers

Check connection from the application servers by following the procedure described in one of the following:

- For a Windows environment, see *Section B.3: "Checking Connection from Application Server (Windows)"*.
- For a Linux environment, *Section D.3: "Checking Connection from Application Server (Linux)"*.

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Initializing an iSCSI Disk Array

This chapter describes how to initialize a disk array configured for iSCSI connection.

Overview

To set FC connection first in a disk array configured for both FC and iSCSI connections, see "Initializing a Disk Array (FC)" to make the setting and then perform the procedure in this chapter.

To set iSCSI connection first, perform the procedure in this chapter and then see "Initializing a Disk Array (FC)" to make the setting and then perform the procedure in this chapter.

IMPORTANT: To initialize a disk array configured for FC connection, see "Initializing a Disk Array (FC)" .

The initialization consists of:

1. **Collecting host information**
   - Collect host information from the application server.
   - For details about the procedure, see *"Collecting Host Information From Application Servers"*.
2. **Initializing the disk array by using the initialization wizard**
   - Use the initialization wizard to make the basic settings of the disk array.
   - For details about the procedure, see *"Initialization Wizard"*.
3. **Binding a pool**
   - Bind a pool in the disk array.
   - For details about the procedure, see *"Binding a Pool"*.
4. **Binding a hot spare**
   - Bind a hot spare. This step is not required unless a hot spare is bound.
   - For details about the procedure, see *"Binding a Hot Spare"*.
5. **Binding logical disks**
   - Bind logical disks.
   - For details about the procedure, see *"Binding Logical Disks"*.
6. **Assigning the logical disks to application servers**
   - Assign the logical disk to the application servers.
   - For details about the procedure, *"Assigning Logical Disk"*.
7. **Checking connection from the application servers**

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- Check that the application servers to which the logical disk has been assigned can access the disk array.
- For details about the procedure, see *"Checking Connection from Application Server"*.

Initialization by SnapSAN Manager Initialization Wizard

Overview

Use initialization wizard to make the basic settings of a disk array.

Operations to be performed on the initialization wizard are:

1. Set the disk array subsystem name
   - Change and/or confirm a disk array subsystem name.
2. Set time
   - Set time by configuring the NTP server, or manually.
3. Set host connection ports
4. Set iSNS server
   - Register the iSNS server information for setting the iSNS server.

Start Initialization Wizard

Click **Configuration** and **Initialization** on the left pane to open the menu. Then click **Start** to start the initialization wizard.

Before the initialization starts, the following confirmation message appears.

5. Click **Yes** to start the Initialization Wizard.

When the Initialization Wizard starts, perform the settings as prompted.

1. Confirm the **Normal Setting** check box is selected and then click **Next**.
2. Perform the following steps to change a disk array name:
   a. Enter a new name in the **New Disk Array Subsystem Name** box.
   b. Confirm the name and click **Next**.

IMPORTANT: For the procedure when the **Set the time manually** option is selected, see *Configuration Setting Tool User's Manual (GUI) for the SnapSAN 3000/5000*.

3. To set NTP server, enter the required information and click **Next**.
4. Select a port from the host connection port list and click **Edit**. The dialog box for editing the settings of the selected port appears.

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a. When editing the settings of host connection ports is completed, click **Next** on the Host connection port parameters (iSCSI) page.

b. To change the settings for another port, select the port to edit from the host connection port list and click **Edit**.

Parameter	Description
Port number	Displays unique number for the port.
Port name	Specify a port name.
Link Speed & Duplex	Displays the value of the link speed duplex. These values cannot be changed.
MTU	Select a MTU (Maximum Transmission Unit) size from the drop-down list. Change the size according to the network environment in use. The default value is 1500.
IP address	Specify an IP address to be set for the port.
Subnet mask	Specify a subnet mask or subnet prefix to be set for the port.
Gateway address	Specify a gateway address to be set for the port.

c. Clicking **OK** applies the change of settings to the list.

d. When you click **Next** after changing the port settings as needed, the port settings are made.

CAUTION: Please perform another setup after waiting about 30 seconds after processing when a setup or change of an IP address is made. When MTU is changed, communication with other ports in addition to the iSCSI port may temporarily be interrupted.

5. When any iSNS server is used, register the iSNS server information.

Parameter	Description
iSNS server IP address and port number list	Displays the IP address and port number of the iSNS server.
Add	Click this button to add iSNS server information. This information appears on the **iSNS server IP address and port number list**.
Edit	Select an iSNS server from the iSNS server IP address and **Port number list**. Then click **Edit** to modify the iSNS information.
Delete	Select an iSNS server from the iSNS server IP address and **Port number list**. Then click **Delete** to modify the iSNS information.

Perform any of the following steps:

- To set the iSNS servers to be monitored by the disk arrays supporting iSCSI, click **Add** to enter the necessary information. Then click **Next** to go on to **Finish initialization wizard** page.

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- To not use the iSNS server, click **Next** to move on to license unlock procedure.

6. Confirm that the initialization is completed.

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Parameter	Description
Operate iSCSI Easy Config Tool on the host machine	The initialization is suspended to perform initialization by using iSCSI Setup Tool.
Bind pool	When you click this hyperlink, the Pool Bind page appears to start pool binding.

7. Perform the following operations:
   a. Click **Operate iSCSI Easy Config Tool on the host machine** to continue the initialization by using the iSCSI Setup Tool.
   b. When the following window appears, see *Section : iSCSI Setup Tool* and perform initialization by using iSCSI Setup Tool. And then click **Bind pool** to bind pools.

iSCSI Setup Tool

Use iSCSI Setup tool on application servers to configure the settings required on the application servers.

For details of the procedure, see either of the following sections according to the platform of the application servers.

- For Windows application servers, see *iSCSI Setup Tool*.
- For Linux application servers, see *iSCSI Setup Tool*.

Binding a Pool

Perform basic settings for binding a pool.

Parameter	Description
Show pool list	Click Show pool list to see the list of existing pools. Click Close pool list to hide the pool list.
Physical disk type	Select the type of physical disks to configure a pool.
RAID type	Select the RAID type of the pool.

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Parameter	Description
Auto disk selection	Select the number of physical disks to be used from the **Number of physical disks** and the capacity per physical disk from **Physical disk capacity**. The selectable numbers of physical disks are: RAID6(4+PQ): 6 disks or more RAID6(8+PQ): 10 disks or more RAID5(2+P): 3 disks or more RAID5(4+P): 5 disks or more RAID5(8+P): 9 disks or more RAID-TM: 3 disks or more RAID1: 2 disks or more
Manual disk selection	Select this option and click **Select physical disks** to manually select physical disks to be used for a pool.
Calculate pool capacity	Click this button to see the estimated capacity of the pool in **Total capacity of the pool**. When **Physical disk type**, **RAID type**, **Number of physical disks**, **Physical disk capacity** is changed, there is possibility that "calculating" is displayed temporarily under **Total capacity of the pool.**

Perform the following steps to bind a pool:

1. Select the type of physical disk from **Physical disk type**.
2. Select the type of RAID from the **RAID type** from the drop-down list menu.
3. Select the number of physical disk that configure the pool and their capacity using either **Auto disk selection** option or **Manual disk selection** option.

CAUTION: When 61 or more physical disks configure a pool, pool expansion is automatically performed.The value for **Total capacity of the pool** displayed for a pool configuration with 61 or more physical disks is a rough estimate.

4. Click **Next** to move on to the page for confirming settings.

The page for confirming the settings of pool binding appears. This screen lists the settings of the pool to be bound.

Parameter	Description
Basic Settings	Displays basic settings to be used for binding a pool.
Advanced Settings	Displays default advanced settings to be used for binding a pool.
Advanced	Click **Advanced** to modify the default settings displayed under **Advanced Settings**.
Physical disks to configure the pool	Displays details of physical disks used to configure a pool.

5. Check if the list has any problems. If the list has no problems, click **Set** to display the confirmation dialog box
6. Click **Yes** to perform pool binding. When the binding is completed, the completion page appears.

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CAUTION: When a physical disk to be used has stopped with the power saving function on, it takes time to bind the pool.When the first pool is bound, a system volume (8 GB) is automatically created.

When the pool binding is successfully completed, the result of pool binding appears.

.

Parameter	Description
Bind another pool	Click this hyperlink to reopen the **Pool Bind** page to bind another pool.
Bind hot spare	Click this hyperlink to open the **Hot Spare Bind** page.
Bind logical disk	Click this hyperlink to open the **Logical Disk Bind** page.

Binding a Hot Spare

The **Hot Spare Bind** page has the view display and the list display. The displays can be switched by clicking the tabs.

Parameter	Description
List	By default, the List view is displayed. The List view displays a list of physical disks available to bind a spare. Select the specified check box of the physical disk for which hot spare will be bound.
View	Click this tab for the visual display of physical disks available to bind a spare. Select the specified check box of the physical disk for which hot spare will be bound.
Pool list	Select a physical disk to create a hot spare. When you select the physical disk for hot spare binding, Enabled is displayed under the **Enable Hot Spare** field of the Pool list. Pools that are enabled by a newly bound hot spare are shown in bold letters.
Enable the copy back mode	Select this option to enable copy back mode. When a faulty disk is replaced by a new disk, copy back mode automatically copies back the data to the new disk.

Perform the following steps to bind a hot spare:

1. Select one or more physical disks for hot spare binding.

CAUTION: For slots having no physical disks, the slot names and check boxes are grayed out in the visual display, and the slots are not listed in the list display. For physical disks for which a pool has been bound, the check boxes are grayed out in the visual display, and the disks are not listed in the list display.

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2. Click **Set** to display the confirmation dialog box.
3. Click **Yes** to perform hot spare binding.
   When the hot spare binding is completed, the result dialog box appears.

Parameter	Description
Bind another hot spare	Click this hyperlink to reopen the **Hot Spare Bind** page to bind another hot spare.
Bind pool	Click this hyperlink to open the **Pool Bind** page to bind another pool.
Bind logical disk	Click this hyperlink to open the **Logical Disk Bind** page.

Binding Logical Disk

This section explains how to bind a logical disk.

Parameter	Description
Pool list	Displays details of already bound pools. Select a pool in which logical disks will be bound.
Show all pools	By clearing this check box, you can view only the pool that is bound this time.
Show logical disks of the selected pool	Click this button to confirm a list of logical disks that are bound in the currently selected pool.
Number of logical disks	Specify the number of logical disks to be bound in the spinner.
Logical disk capacity	Specify the capacity of logical disks to be bound in the spinner.
Logical disk capacity	Indicates the capacity of a single logical disk.
Capacity logical disks consume	Indicates total size of the space occupied by logical disks.
Unused capacity of the pool	Indicates free space available in a pool.
Logical disk name	Enter a logical disk name. If two or more logical disks are bound, enter the prefix for them.

1. Select a pool in which logical disks will be bound, enter the number and capacity of logical disks, and click **Next**.

The settings of the logical disk to be bound are listed. Confirm the logical disk binding settings.

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Parameter	Description
Basic logical disk settings	Displays the basic settings to be used for binding logical disks.
Pool information	Displays pool information.
Logical Disk Advanced Settings	Displays default advanced settings to be used for binding a logical disk.
Advanced	Click **Advanced** to modify the default settings displayed under Logical Disk Advanced Settings.
Logical disks to be bound	Displays the details of the logical disks to be bound.

2. Perform the following steps for binding a logical disk:
   a. The settings of the logical disk to be bound are listed. Confirm the settings.
   b. To perform advanced settings, click **Advanced**.
   c. After confirming the settings, click **Set** to display the confirmation message.
   d. Click **Yes** to perform the logical disk binding.

The result of the logical disk binding appears.

Parameter	Description
Bind another logical disk	Click this hyperlink to reopen the **Logical Disk Bind** page for another logical disk binding.
Assign logical disks to the host	Click this hyperlink to open the **Assignment of Logical Disk** page.

3. To assign the bound logical disk to a host, click **Assign logical disks to the host**.

Parameter	Description
Host List	Displays hosts registered with the disk array. Click a host to which you want to assign logical disks.
Add unlisted host	Click this button to display a host addition page on which another host can be added.
Show all assignable logical disks	Select this check box to display all logical disks that can be assigned.
Select drop-down list	Select the logical disk list display type from the drop-down list.
LD List	Displays host information registered with the disk array. Click a logical disk you want to assign. Select logical disks to assign to host.

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CAUTION: The display items can be sorted, however, the order cannot be changed. Multiple logical disks can be selected at a time.

4. Perform the following steps:
   a. Select hosts from the **Host List** to which logical disks will be assigned.
   b. Select logical disks from the **LD List** to which hosts will be assigned.
   c. Click **Next**

Parameter	Description
Host List	Displays the host to which logical disks will be assigned.
LDs Assignable to Host	Displays logical disks to be assigned to the host.
Change LUN	Click this button to open the LUN Settings page, which allows configuring LUN (Logical Unit Number) settings.

5. Check the setting and click **Set** to perform the logical disk assignation. When the assignation is completed, the completion page appears.

Parameter	Description
Assign other logical disks to the host	Click this hyperlink to assign another logical disk to the host.

6. The initialization is now complete. Click **Finish**.

Checking Connection from Application Server

Check connection from the application servers by following the procedure described in one of the following:

- For a Windows environment, see *Section C.3: Checking Connection from Application Server*.
- For a Linux environment, see *Section E.3: Checking Connection from Application Server*.
- For a VMware environment, see*Section F.2: Checking Connection from Application Server*.

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Chapter 5

Initializing a SAS Disk Array

This chapter describes how to initialize a disk array configured for SAS connection.

Overview

The initialization consists of:

1. **Collecting host information**
   - Collect host information from the application server.
   - For details about the procedure, see *Section : "Collecting Host Information From Application Servers"*.
2. **Initializing the disk array by using the initialization wizard**
   - Use the initialization wizard to make the basic settings of the disk array.
   - For details about the procedure, see *Section : "Initialization Wizard"*.
3. **Binding a pool**
   - Bind a pool in the disk array.
   - For details about the procedure, see *Section : "Binding a Pool"*.
4. **Binding a hot spare**
   - Bind a hot spare. This step is not required unless a hot spare is bound.
   - For details about the procedure, see *Section : "Binding a Hot Spare"*.
5. **Binding logical disks**
   - Bind logical disks.
   - For details about the procedure, see *Section : "Binding Logical Disks"*.
6. **Assigning the logical disks to the application servers**
   - Assign the created logical disk to the application servers.
   - For details about the procedure, see *Section : "Assigning Logical Disks"*.
7. **Checking connection from the application servers**
   - Check that the application server to which the logical disks have been assigned can access the disk array.
   - For details about the procedure, see *Section : "Checking Connection from Application Servers"*.

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Collecting Host Information From Application Servers

If the OS used on the application servers is Windows, it is unnecessary to perform the procedure described in this section. In this case, create a host manually, and then assign the port connected to the disk array to the host by referring to *Section 7.3.5: Collecting Host Information*.

The host information is collected from the application server. When there is any Linux (RHEL5 or later or SLES10 or later) application server and the servers used in the system are all new (servers that have not begun operating), host information can be collected through the disk array.

To collect host information when the disk array is installed in a system that has already begun operating or there is any application server on a different operating system, see *Section D.2.1: "Collecting Host Information by Using File Output"* for a Linux environment.

1. **Configurations where host information can be collected automatically or through a disk array**

When the OS of new servers to be connected by SAS cables is Linux (RHEL5 or later or SLES10 or later) and a disk array is newly installed, host information can be collected through the disk array.

For details about the setting, see *Section 7.3.5: "Collecting Host Information"*.

To collect host information without connecting SAS cables in one of the configurations above, see *Section D.2.1: "Collecting Host Information by Using File Output"* for a Linux environment.

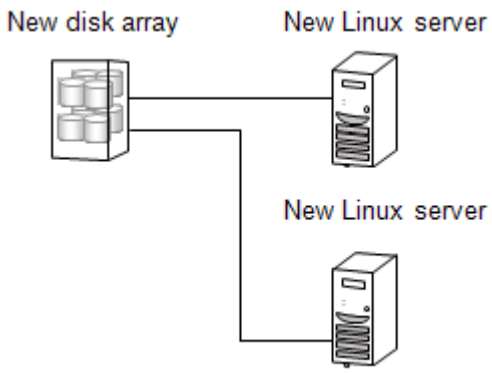

Figure 5-1: Configuration - Auto-Collection of Host Information

2. **Collecting host information by using files reported by the host information collection command.**

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When a disk array is installed in a system that has already begun operating, use the host information collection command to report files. Registering the reported files allows assigning the application server to created logical disks. For details about how to register reported files, see *Section D.2.2: "Registering Host Information by Using File Output"*.

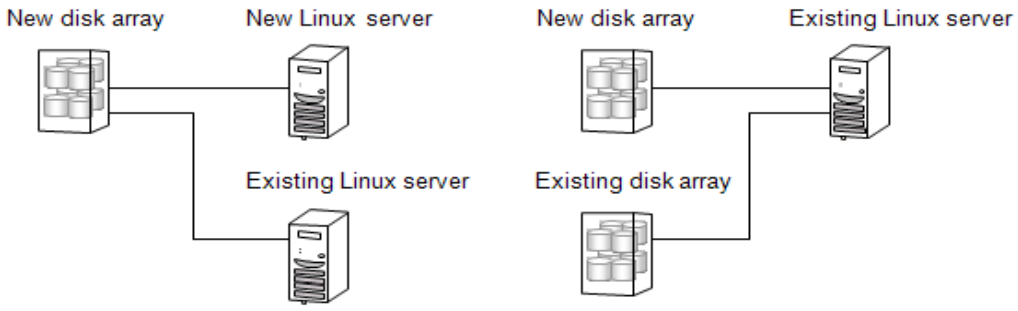

Figure 5-2: Configuration - Collect Host Information Using Host Information Collection Command

Collecting Host Information From Application Server

- To make settings for collecting host information automatically or through a disk array, see *Section 7.3.5: "Collecting Host Information"*.
  - For details about how to collect host information, see one of the following depending on the platform of the application server:
- For a Linux application server, see *Section D.2: "Collecting/Registering Host Information on Application Server"*.

Initialization by Path Manager for Windows Manager Initialization Wizard

Overview

Use the initialization wizard to make the basic settings of a disk array.

Operations to be performed on the initialization wizard are:

- Set the disk array subsystem name
  - Change and/or confirm a disk array name.
- Set time
  - Set time by configuring the NTP server, or manually.
- Host connection port parameters (SAS)
- Set the host connection port.

Start Initialization wizard

Click **Configuration** and **Initialization** on the left pane to open the menu. Then click **Start** to start the initialization wizard.

3. Click **Yes** to start the initialization wizard.
4. When the initialization wizard starts, perform the settings as prompted.
5. Select the setting type for initialization.

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IMPORTANT: To perform quick setting, see *Configuration Setting Tool User's Manual (GUI) for the SnapSAN 3000/5000*.

NOTE: Quick Setting cannot be used: for the disk arrays of the SnapSAN 5000 or later; when Access Control is enabled and; if unused physical disk are different in type, capacity or rotation speed.

1. Confirm the **Normal Setting checkbox** is selected, and then click **Next**.
2. Perform the following steps to change a disk array name:
   a. Enter a new name in the **New Disk Array Subsystem Name** box.
   b. Confirm the name and click **Next**
3. .To configure a time using NTP, select **Synchronize the time with the NTP server** and click **Next**.

NOTE: Quick Setting cannot be used: for the disk arrays of the SnapSAN 5000 or later; when Access Control is enabled and; if unused physical disk are different in type, capacity or rotation speed.

Parameter	Description
Port number	Unique port number
Port name	Specify the name to be assigned to the port.
Platform	Specify the platform of the host to be connected.
Data rate	Specify the value corresponding to the data transfer rate of the HBA or HUB.

   a. Clicking **OK** applies the change of settings to the list.
   b. When you click **Next** after changing the port settings as needed, the port settings are made.
4. Confirm that the initialization is finished.

Parameter	Description
Bind pool	When you click this hyperlink, the **Pool Bind** page appears for starting pool binding.

5. To move on to pool binding, click **Bind pool**.

NOTE: When the initialization is complete, the Access Control function starts automatically, and then all the SAS ports change to the port mode for SAS model.

Binding a Pool

Perform basic settings for binding a pool.

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Pool Bind

Parameter	Description
Show pool list	Click **Show pool list** to see the list of existing pools. Click **Close pool list** to hide the pool list.
Physical disk type	Select the type of physical disks that configure a pool.
RAID type	Select the RAID type of the pool.
Auto disk selection	Specify the number of physical disks to be used from the **Number of physical disks** and the capacity per physical disk from **Physical disk capacity**. The selectable numbers of physical disks are: RAID6(4+PQ): 6 disks or more RAID6(8+PQ): 10 disks or more RAID5(2+P): 3 disks or more RAID5(4+P): 5 disks or more RAID5(8+P): 9 disks or more RAID-TM: 3 disks or more RAID1: 2 disks or more
Manual disk selection	Select this option and click **Select physical disks** to manually select physical disks to be used for a pool.
Calculate pool capacity	Click this button to see an estimated capacity of a pool in **Total capacity of the pool**. When **Physical disk type**, **RAID type**, **Number of physical disks**, **Physical disk capacity** is changed, there is possibility that “calculating” is displayed temporarily under **Total capacity of the pool.**

Perform the following steps to bind a pool:

1. Select the type of physical disk from **Physical disk type**.
2. Select the type of RAID from the **RAID type** drop-down list menu.
3. Select the number of physical disk that configure the pool and their capacity using either **Auto disk selection** option or **Manual disk selection** option.

NOTE: When 61 or more physical disks configure a pool, pool expansion is automatically performed.
The value for **Total capacity of the pool** displayed for a pool configuration with 61 or more physical disks is rough estimate.

Click **Next** to move on to the step for checking settings.

Parameter	Description
Basic Settings	Displays basic settings to be used for binding a pool.
Advanced Settings	Displays default advanced settings to be used for binding a pool.
Advanced	Click **Advanced** to modify the default settings displayed under **Advanced Settings**.
Physical disks to configure the pool	Displays details of physical disks used to configure a pool.

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4. Check if the list has any problems. If the list has no problems, click **Set** to display the confirmation message
5. Click **Yes** to perform pool binding. When the binding is completed, the completion window appears.

NOTE: When a physical disk to be used is stopped with the power saving function on, it takes time to bind the pool.When the first pool is bound, a system value (8 GB) is automatically created.

When the pool binding is successfully completed, the result of pool binding appears.

Parameter	Description
Bind another pool	Click this hyperlink to reopen the **Pool Bind** page to bind another pool.
Bind hot spare	Click this hyperlink to open the **Hot Spare Bind** page.
Bind logical disk	Click this hyperlink to open the **Logical Disk Bind** page.

Binding a Hot Spare

This section explains how to bind a hot spare.

Hot Spare Bind

Parameter	Description
List	By default, the List view is displayed. The List view displays a list of physical disks available to bind a spare. Select the specified check box of the physical disk for which hot spare will be bound.
View	Click this tab for the visual display of physical disks available to bind a spare. Select the specified check box of the physical disk for which hot spare will be bound.
Pool list	Select a physical disk to create a hot spare. When you select the physical disk for hot spare binding, Enabled is displayed under the **Enable Hot Spare** field of the Pool list. Pools that are enabled by a newly bound hot spare are shown in bold.
Enable the copy back mode	Select this option to enable copy back mode. When a faulty disk is replaced by a new disk, copy back mode automatically copies back the data to the new disk.

Perform the following steps to bind a hot spare:

1. Select one or more physical disks for hot spare binding.
2. When you select the physical disks, pools with **Enable Hot Spare** are displayed in bold letters.

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NOTE: For slots having no physical disks, the slot names and check boxes are grayed out in the view display, and the slots are not listed in the list display.
For physical disks for which a pool has been bound, the check boxes are grayed out in the view display, and the disks are not listed in the list display.

3. Click **Set** to display the following confirmation message.
4. Click **Yes** to perform hot spare binding.
   When the hot spare binding is completed, the result dialog box appears.

Parameter	Description
Bind another hot spare	Click this hyperlink to reopen the **Hot Spare Bind** page to bind another hot spare.
Bind pool	Click this hyperlink to open the **Pool Bind** page to bind another pool.
Bind logical disk	Click this hyperlink to open the **Logical Disk Bind** page.

Binding Logical Disks

This section explains how to bind logical disks.

Logical Disk Bind

Parameter	Description
Pool list	Displays details of already bound pools. Select a pool in which logical disks will be bound.
Show all pools	By clearing this check box, you can view only the pool that is bound this time.
Show logical disks of the selected pool	Click this button to confirm a list of logical disks that are bound in the currently selected pool.
Number of logical disks	Specify the number of logical disks to be bound in the spinner.
Logical disk capacity	Specify the capacity of logical disks to be bound in the spinner.
Logical disk capacity	Indicates the space size consumed by logical disks.
Capacity logical disks consume	Indicates total size of the space occupied by logical disks.
Unused capacity of the pool	Indicates free space available in a pool.
Logical disk name	Displays the automatically assigned logical disk name. To change the logical disk name, enter a new logical disk name. If two or more logical disks are bound, enter a prefix for them.

5. Select a pool in which logical disks will be bound, enter the number and capacity of logical disks, and click **Next**.

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Parameter	Description
Pool information	Displays pool information.
Basic logical disk settings	Displays the basic settings to be used for binding logical disks.
Logical Disk Advanced Settings	Displays default advanced settings to be used for binding a logical disk.
Advanced	Click **Advanced** to modify the default settings displayed under **Logical disk advanced settings**.
Logical disks to be bound	Displays the details of the logical disks to be bound.

6. Perform the following steps for binding a logical disk.
   a. The settings of the logical disk to be bound are listed. Confirm the settings.
   b. To perform advanced settings, click **Advanced**.
   c. After confirming the settings, click **Set** to display the following confirmation message.
   d. Click **Yes** to perform the logical-disk binding.

The result of the logical disk binding appears

Parameter	Description
Bind another logical disk	Click this hyperlink to reopen the **Logical Disk Bind** page for another logical disk binding.
Set the host to which logical disks will be assigned	Click this hyperlink, to open the **Host Information Collection** page.
Assign logical disks to the host	Click this hyperlink to open the **Assignment of Logical Disk** page.

7. Click **Set the host to which logical disks will be assigned** to retrieve the information of the host to which logical disks that have been bound are assigned.
8. Select how to collect host information.

Parameter	Description
Collect host information automatically (Linux only).	Select this option to retrieve host information automatically by showing the volume for information retrieval to all hosts.
Update with host information file. (Linux only)	Select this option to configure host information by using the files for host information retrieved on application servers.
Create host information manually. (Windows, Linux, VMware or Hyper-V)	Select this option by manually entering interfaces with hosts, host names, platforms, and port numbers to configure host information. When using a Windows, VMware, or Hyper-V host, select this option.

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9. Select **Create host information manually** and click **Next**.

Parameter	Description
Host Name	Specify a host name.
Platform	Specify the platform.
Path List view	This list view lets you check the specified port information.
Add Port button	Set the port(s) for the host you are adding.
Change button	By selecting the added port from the path list view, and then clicking the **Change** button, the port change screen appears. You can change the selected port information on this screen.
Delete button	By selecting the added port from the path list view, and then clicking the **Delete** button, you can delete the selected port from the host.

10. Specify a host name, platform, and path, and then click the **Set** button to register a new host.

The result of the logical-disk binding appears.

Parameter	Description
Assign logical disks to the host	Click this hyperlink to assign the bound logical disks to hosts whose information has been retrieved.

Assignment of Logical Disks

Parameter	Description
Host List	Displays hosts registered with the disk array. Click a host to which you want to assign logical disks.
Register information of a host	Click this hyperlink if you cannot find the target host listed in the **Host list** and want to jump to the **Host Information Collection** page.
Show all assignable logical disks	Select this check box to display all logical disks that can be assigned.
Select drop-down list	Select the logical disk list display type from the drop-down list.
LD List	Displays the list of logical disks bound in the disk array. Click a logical disk you want to assign.

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CAUTION: The display items can be sorted, however, the order cannot be changed. Multiple logical disks can be selected at the same time

Perform the following steps:

1. Select hosts from the **Host List** to which logical disks will be assigned.
2. Select logical disks from the **LD List** to which hosts will be assigned.
3. Click **Next**.

Parameter	Description
Host List	Displays the hosts to which logical disks will be assigned.
LDs Assignable to Host	Displays logical disks to be assigned to the host.
Change LUN	Click this button to open the LUN Settings page, which allows configuring LUN (Logical Unit Number) setting.

4. Check the setting and click **Set** to perform the logical disk assignation. When the assignation is completed, the completion page appears.

Parameter	Description
Assign logical disks to another host	Click this hyperlink to assign another logical disk to the host.
Register information of a host	Click this hyperlink to open the Host Information Collection page.

5. The initialization is now complete. Click **Finish**.

Checking Connection from Application Servers

Check connection from the application servers by following the procedure described in one of the following:

- For a Windows environment, see *Section B.3: "Checking Connection from Application Server (Windows)"*.
- For a Linux environment, *Section D.3: "Checking Connection from Application Server (Linux)"*.

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Configuration Changes

This chapter describes how to change the settings of a disk array controller after use of the disk array controller is started.

Modifying the Settings by Using DIP Switches

The SnapSAN 3000/5000 does not require modification of the settings by using DIP switches. Do not change the configuration of the DIP switches located on the surface of the controller.

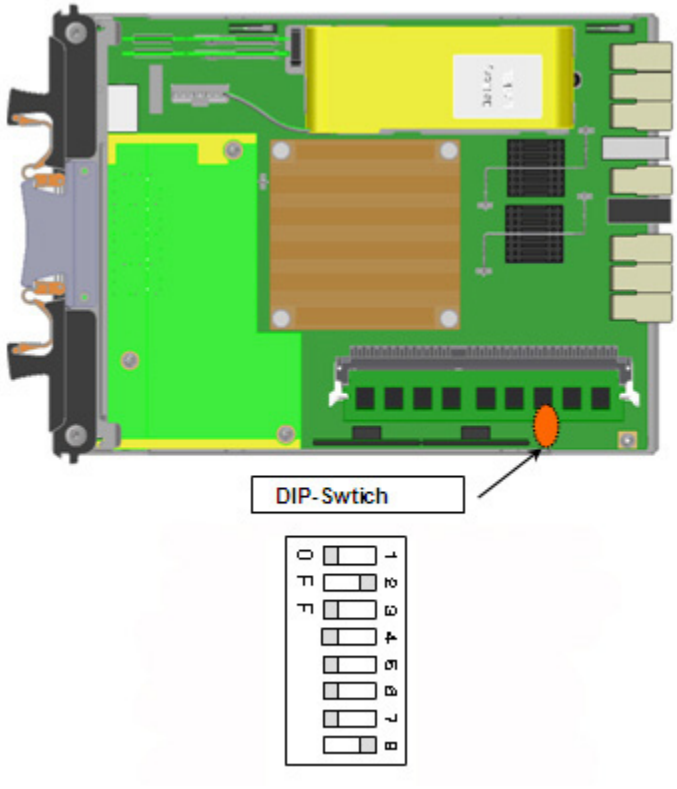

Figure 6-1: DIP Switch

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Modifying the Configuration by SnapSAN Manager (FC/SAS)

This section provides information on modifying the configuration of an FC or SAS connected disk array by SnapSAN Manager.

Binding Additional Logical Disks (FC/SAS)

This section describes how to bind additional logical disks on an FC or SAS connected disk array.

To bind additional logical disks on an FC or SAS connected disk array, click **Configuration**, **Logical Disk** and **Logical Disk Bind** on the left pane of the window.

See *Section : "Adding Application Servers"* to bind additional logical disks when an application server is added.

7. Click **Configuration**, **Logical Disk** and **Logical Disk Bind** on the left pane of the window to start binding the logical disks.
8. The rest of the procedure is the same as the procedure in *Section 5.3.4: "Binding Logical Disks"* or *Section 7.3.4: "Binding Logical Disks"*.
9. Assign the logical disks to the host.
10. Lastly, assign the logical disks you have created to the application server.
11. On the **Logical Disk Binding Completion** window, click **Assign logical disk to the host** to start assigning the logical disks.

    The rest of the procedure is the same as the procedure in *Section 5.3.5: "Collecting Host Information"*.

Using the Initialization Wizard to Modify the Configuration

The configuration can be modified by re-running the initialization wizard.

The procedure is the same as the procedure for the first settings. For details of the procedure see *Section 5.3.1: "Initialization Wizard"* or *Section 7.3.1: "Initialization Wizard"*.

When you re-run the initialization wizard, SnapSAN Manager issues a message asking whether to stop monitoring of the target disk array by SnapSAN Manager and to proceed with the initialization. Click **Yes** and stop monitoring of the disk array to modify the configuration.

Modifying the Disk Array Configuration

Each setting configured by the initialization wizard can be modified individually.

See *Table 1-1: Relation between the initialization wizard and configuration settings* to find how the settings configured in the initialization wizard and configuration settings are related.

Setting in the Initialization Wizard	How to Modify the Setting
Set Disk Array Subsystem Name	Select **Disk Array** > **Disk Array Management** > **Change of Settings**.
Time Settings	Select **Disk Array** > **Time Settings**.
License Unlock	Select **Disk Array** > **License Unlock**.

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Setting in the Initialization Wizard	How to Modify the Setting
Host Connection Port Parameters (FC)	Select **Disk Array** > **Host Connection Port** > **Host Connection Port Setting (FC)**.
Host Connection Port Parameters (SAS)	Select **Disk Array** > **Host Connection Port** > **Host Connection Port Setting (SAS)**.
Port Mode Switching	Select **Disk Array** > **Host Connection Port** > **Port Mode Switching**.

Modifying the Configuration by SnapSAN Manager (iSCSI)

This section provides information on modifying the configuration of an iSCSI connected disk array by SnapSAN Manager.

Binding Additional Logical Disks (iSCSI)

This section describes how to bind additional logical disks on an iSCSI connected disk array.

To bind additional logical disks on an iSCSI connected disk array, click **Configuration** and **Logical Disk**, and **Logical Disk Bind** on the left pane of the window.

For the details of the procedure after the startup, see *Section 6.2.5: "Binding Logical Disk"*.

Using the Initialization Wizard to Modify the Configuration

The configuration can be modified by re-running the initialization wizard.

The procedure is the same as the procedure for the first settings. For details of the procedure see, *Section 6.2.1: "Initialization Wizard"*.

When you re-run the initialization wizard, SnapSAN Manager issues a message asking whether to stop monitoring of the target disk array by SnapSAN Manager and to proceed with the initialization. Click **Yes** and stop monitoring of the disk array to modify the configuration.

Modifying the Disk Array Configuration

Each setting configured by the initialization wizard can be modified individually.

See *Table 1-2: Relation between the initialization wizard and configuration settings* to find how the settings configured in the initialization wizard and configuration settings are related.

Initialization Wizard Settings	Settings Modification
Set Disk Array Subsystem Name	Select **Disk Array** > **Disk Array Management** > **Change of Settings**.
Time Settings	Select **Disk Array** > **Time Settings**.
Setting host connection port parameters (iSCSI)	Select **Disk Array** > **Host Connection Port** > **Host Connection Port Settings (iSCSI)**.
Setting iSNS server	Select **Disk Array** > **iSNS Server Settings**.
License Unlock	Select **Disk Array** > **License Unlock**.

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Performance Monitoring

This chapter describes how to use the Performance Monitor (performance monitoring function). The performance monitoring function is for monitoring the performance of the SnapSAN 3000/ 5000 disk array subsystem, collecting performance information, and displaying the performance in real-time.

The performance monitoring function is a function for centrally monitoring performance of storage devices when the devices are under control of the iSM. The use of this performance monitoring function is capable of real-time monitoring of loads, detection of overload, analysis and management of statistic information (performance information of the past). Since real-time monitoring of loads is a short-term analysis, the performance data of a disk array are displayed with numerical values or graphs on the iSM client Performance Monitoring screen. The overload monitoring function detects abnormalities during operation, and outputs messages for notification when the performance value exceeding the specified threshold value is detected. Since analysis and management of statistic information are a long-term analysis, the performance data of disk arrays are accumulated as a statistic information history file. These accumulated statistic information history files can be analyzed by the Performance Analysis Supporting Tool (CLI and GUI).

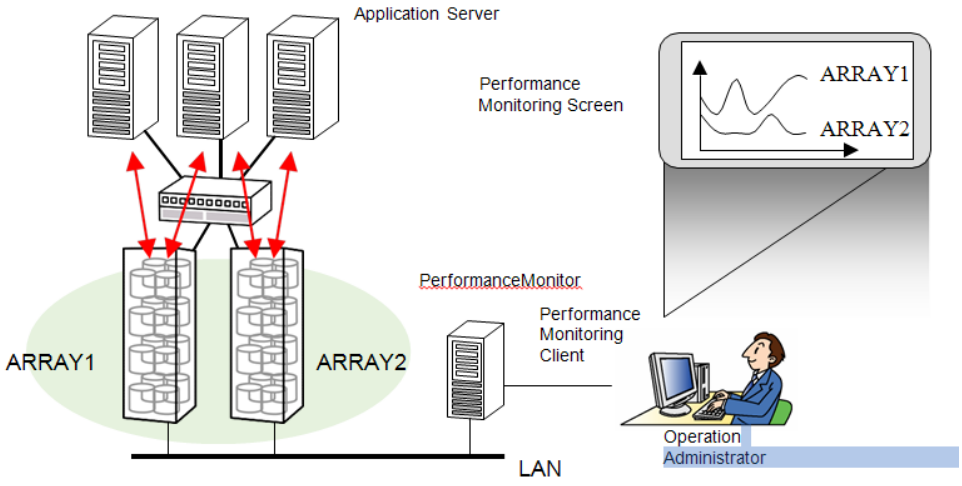

Figure 7-1: Performance Analysis Supporting Tool

The following program product enables to utilize the performance information accumulated by

Performance Monitor and also analyze the storage performance from different angles.

- AutoTune

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Operation of Performance Monitoring Function

This section describes operations of the performance monitoring function. The performance monitoring function is operated in the flows shown below:

OPERATION FLOW

1. Installation
Installing performance monitoring function
Installation of the performance monitoring function is accompanied by installing iSM at the same time.

2. Specifying targets of monitoring performance in real-time
For defining the targets of monitoring performances, specify disk array, ports, logical disks, and physical disks composing logical disks used in operations requiring responsibility such as online processing. Also, specify monitoring items among those allowed for real-time monitoring (I/O Density, transfer rate, etc.). For example, to monitor responses to accesses from an application, average response time and I/O density must be monitored.

3. Analyzing performances
Accumulate the statistic information of performance monitoring target devices, with accesses from application programs. Then analyze the statistic information by summarizing, extracting, and editing. On the basis of the analyzed information, a maximum load level, load fluctuation, and expected period of heavy load and future load regulation are estimated. This analysis is performed regularly. If a problem about performances is expected, an appropriate measure must be taken in advance.

4. Specifying threshold value and monitoring overloads
On the basis of performance analysis results, specify threshold values as indexes for detecting overloads. Loads exceeding a specified threshold value are detected by iSM automatically, and are reported on the iSM Client screen.

5. Detection
Upon detection of overload

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6. Reviewing cause of overload
Display the Performance Monitoring screen on the iSM client or use the threshold operation command on the iSM server to check the location of overload. Then, analyze the accumulated statistic information to determine the cause of the overload.

7. Improving performance
Analysis of statistic information makes it possible to improve performance as shown in the examples provided below. If there is a problem with the file arrangement and the access load concentrates in a specific logical disk, the I/O density of the logical disk should be higher than that of other logical disks and its response time should be longer. If this is the case, it is necessary to review the file arrangement and distribute the load. If a write operation onto the disk is slow, the cache memory is insufficient. A write operation onto physical disks may be simultaneously performed. This status is confirmed by checking to see if the Write Hit ratio is less than 100%. If this is the case, it is recommended that the memory of the disk array be added. If response is not quick although the access density from the application server to the logical disk is low, the access density to another logical disk on the same RANK/pool may be high. This state is confirmed by the fact that the Busy Ratio of the RANK/pool is high. In this case, use the performance optimization function to move the logical disk, which has the high access density, to another RANK/pool and level out the Busy Ratio of each RANK/pool. On the other hand, reviewing the processes of an application to reduce access operations to a disk or improving access efficiency by batch accessing can be good solutions to some cases.

Function Overview

The performance monitoring function includes Real-Time Display of Load Status, Monitoring Overloads, and Statistic Information Analysis Supporting.

Displaying Load Status in Real-Time

This function is capable of displaying the latest load state and usage of the disk array and disk array components. The information is displayed upon the iSM client screen, on the real-time basis. The function, which can monitor performances of multiple disk arrays, allows centralized monitoring on the same view of one iSM client. When storage performance decreases, or symptom of a trouble is seen, use this function to display the performance information of disk array and disk array components, and identify the cause of decreased performances or a fault.

For details on components composing disk array, refer to the “Configuration Setting Tool User’s Manual (GUI)” and “Cache Partitioning User’s Manual”.

The Performance Monitoring screen on the iSM client is capable of displaying the index values for each component type shown in A.1 “Performance Data Displaying in Real-Time”.

Displays the latest load status in numerical values

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Displays the latest load state in bar graphs

Displays the latest load state in time-series graphs.

You can set the update frequency (Display Refresh Rate) of display on the Numeric Table and the Time-series Graph at environment setting. You can also change the setting from the iSM server menu while the iSM server is operating if the performance monitoring screen is not started. For details on environment setting, refer to the installation guide. For changing Display Refresh Rate, refer to the "User's Manual" or "User's Manual (UNIX)" in accordance with your OS in use.

Set the Display Refresh Rate as the number of screen updates per minute. Table 1-1 shows relation between Display Refresh Rate and Display Refresh Interval.

Display refresh rate (times/minute)	1	2	3	4	5	6
Display refresh interval (second)	60	30	20	15	12	10

You cannot change the Display Refresh Rate while the Performance Monitoring screen is started. Change to the Display Refresh Rate applies to all the disk arrays monitored by the server.

Increasing the Display Refresh Rate detects change in the performance information in a shorter interval but the number of components simultaneously display is decreased. This is because the number of collection of performance information by a single disk array controller in certain period is restricted not to obstruct file I/O from the application host in the overhead at collection of performance information. This tendency is eminent especially when statistic information is being stored simultaneously with real-time displaying.

Monitoring Overloads

Specifying a threshold as an index value of overload allows iSM to automatically detect the occurrence of overload in a disk array or a disk array component (occurrence of a load exceeding a specified threshold value). Upon detecting overload, a message (event log/syslog, operation log) notifying overload is displayed. At the same time, asterisks (**) are displayed at the location where the overload occurred on the Performance Monitoring screen. When the occurrence of overload is reported by a message, an administrator must identify the location of overload occurrence on the Performance Monitoring screen. In addition, by specifying the threshold monitoring conditions and conditions to reset threshold excess state, it is possible to perform operations such that overloads in a temporary disturbance are not detected and, when threshold exceeding continues, overloads are detected and notified continuously.

To detect overload of the entire disk array, it is enough to set thresholds for the entire disk array, IOPS of the port, transfer rate, and average response time, and to monitor the performance. You do not have to specify a threshold for each and every logical disk and physical disk. If you need to restrict the I/O load of a specific logical disk and physical disk for some reason such as data of the database application, specify thresholds for the logical disk and physical disk. Then you can detect an abnormal load on them.

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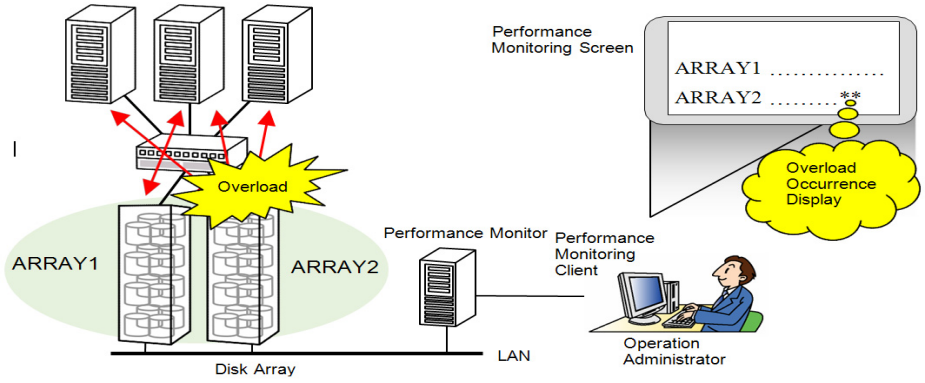

Figure 7-2: Overload Monitor

Threshold values can be specified for each item in A.2 “Performance Data Threshold to Be Monitored”. The unit of specifying a threshold is called a threshold monitoring element. Thresholds can be set using the Performance Monitoring screen of the iSM client or the threshold operation command of the iSM server.

Notifying threshold excess by e-mail

The event link function of the iSM server e-mails a message (message ID: iSM08050) to a specified address in order to notify the occurrence of a threshold excess. For details on the event link function of the iSM server, refer to “Event Link” in the “User’s Manual” of your OS in use. For details of messages, refer to the “Messages Handbook”.

Threshold monitoring conditions

During a background process of disk array, such as batch processing and fault recovery of physical disks, a threshold value may be temporarily exceeded. Upon such a case, which can occur in usual operation, the excess of threshold should not be reported to an administrator. Specifying the monitoring conditions shown below can prevent such unnecessary reporting of the excess of threshold.

1. Threshold monitoring interval

Time interval of detecting a threshold. Default value is the same as Display Refresh Interval.

2. Minimum I/O count

If the number of I/Os in a threshold monitoring interval does not exceed an I/O count specified here, the threshold is not monitored in this interval. A minimum I/O count is specified with the number of I/Os per minute. Default value is 60 per minute.

Threshold monitoring is performed when the number of I/Os in a threshold monitoring interval exceeds the specified minimum I/O count. If the threshold is exceeded, the excess of threshold is reported. By system operation, analyzing performances, and specifying the threshold monitoring conditions on the basis of the analysis, monitoring of overload appropriate for the applications can be performed. Figure1-6 shows an outline of the threshold monitoring interval.

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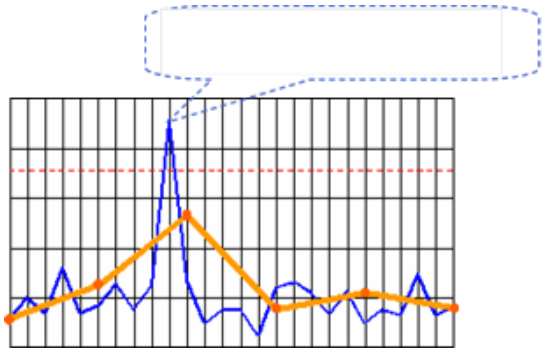

Figure 7-3: Threshold Monitoring Interval

For monitoring overload of a disk array, performance information must be constantly collected from the disk array. If thresholds are set for many monitoring items, collection of performance information burdens the disk array.

The number of monitored items for which a threshold can be set is limited in order to prevent load on the disk array increased by collection of performance information from affecting I/O to and from the application server.

Specification of thresholds for many logical disks and physical disks in a medium or large scale disk array may conflict with the above limit of monitoring items. To prevent this conflict and set thresholds without limit, set the threshold monitoring interval included in the environment definition of the iSM server to “the same as the logging interval”.

This setting enables to decrease the load on the disk array to be increased by threshold monitoring, in conjunction with accumulation of statistic information, which is described in the following section. This measure, however, requires accumulated statistic information.

NOTE: If the threshold monitoring interval is set to “the same as the logging interval”, only the disk array whose statistic information is accumulated is monitored for thresholds. Note that if accumulation of statistic information is stopped, the excess of threshold is not monitored even when thresholds are set for monitoring items.

Resetting threshold excess state

Once a threshold value is exceeded, the value is excluded from threshold monitoring target until the threshold excess state is reset. This feature prevents repeated reporting of the same event of threshold excess state, under largely fluctuating loads.

The threshold excess state can be reset by the Performance Monitoring screen of the iSM client or the threshold operation command of the iSM server. Setting the condition to reset threshold excess state allows automatic reset of threshold excess state when the condition is satisfied. The following conditions can be set for resetting the threshold excess state:

- Time of continued values under threshold

Specify the number of threshold monitoring intervals during which a value is kept under threshold. For each monitoring item satisfying the conditions, threshold excess state is reset. If the number of I/Os does not reach a minimum number of I/Os specified as a threshold monitoring condition, the load of the interval is recognized as under threshold.

- Time of day

At a specified time each day, the threshold excess state is reset for all monitoring items.

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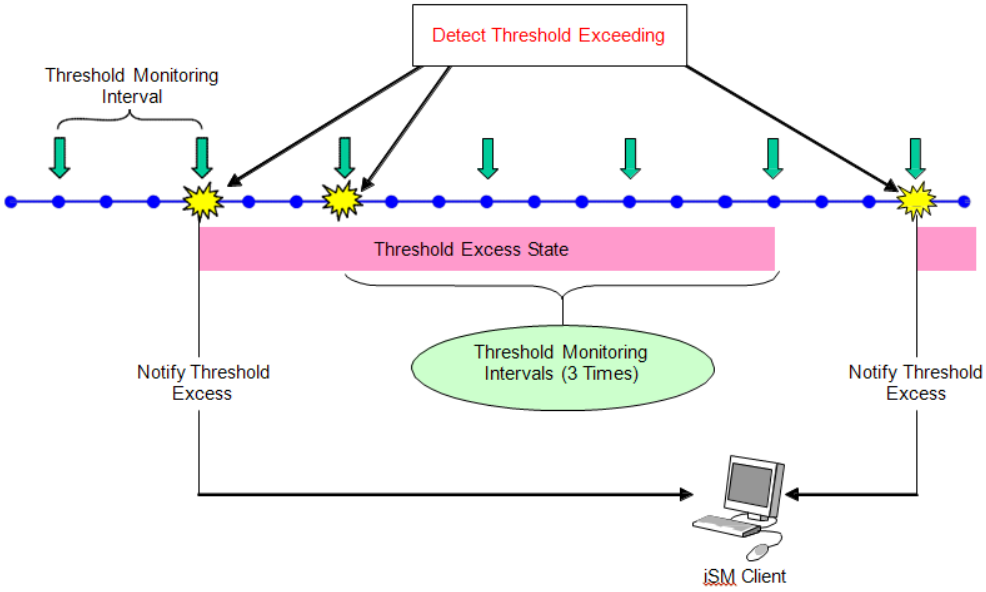

Figure 7-4: Threshold Detection

Supporting Statistic Information Analysis

This function is capable of to accumulating, summarizing, extracting, and editing statistic information about the performances of disk array in a file. Using this function allows long-term accumulation of statistic information which lets you grasp long-term load variations and analysis of performance, for efficient use of the disk array.

A file where statistic information is accumulated is called a statistic information history file. The statistic information history file is stored on the SnapSAN 3000/5000 management server, allowing summarizing, extracting, and editing data on the server. In addition, downloading the statistic information history file allows summarizing extracting, and editing data on an SnapSAN 3000/5000 client.

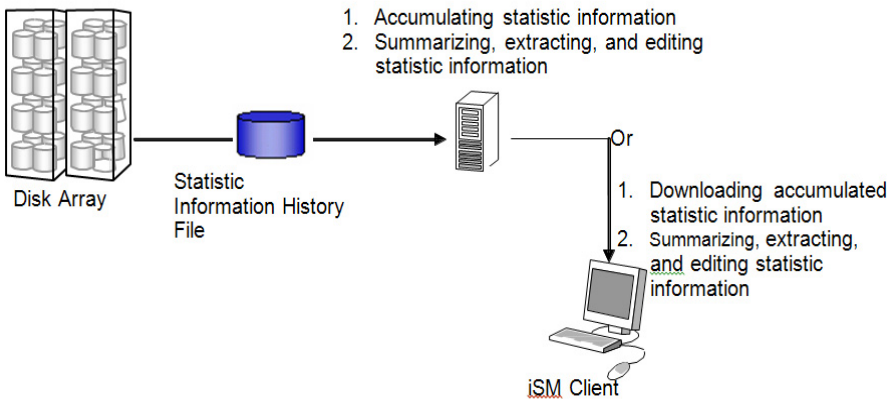
1. Accumulating statistic information
2. Summarizing, extracting, and editing statistic information
Disk Array
Statistic Information History File
Or
1. Downloading accumulated statistic information
2. Summarizing, extracting, and editing statistic information
iSM Client

Figure 7-5: History File

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NOTE: When statistic information has been accumulated for a long term, disk usage of the statistic information history file increases. Therefore, it is necessary to systematically organize statistic information. Increase of disk usage can be prevented by "summarizing statistic information" and "keep period of statistic information".

Accumulating Statistic Information

The statistic information collected from disk array is accumulated in a statistic information history file. One statistic information history file stores the statistic information for up to one day collected from one disk array.

A statistic information history file is automatically created in a directory specified by environment definition.

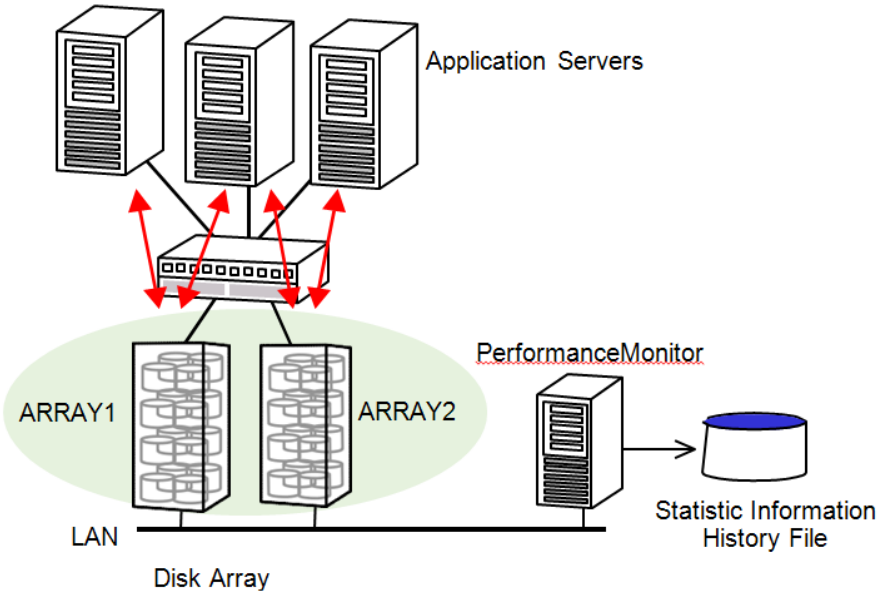

Figure 7-6: Naming Conversion

Statistic information history files are created based on the following naming conversion:

yyyymmdd<Disk Array Name>[#*nnn*].psl

Filename	Description
yyyymmdd	The year, month, and day when accumulation to the statistic information history file started. If date changes while statistic information is being accumulated, accumulation is done to a new statistic information history file. yyyy represents the year (four digits), mm represents the month (a two-digit number), and dd represents the day (a two-digit number).

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Filename	Description
Disk Array Name	This is the name of the disk array. Statistic information history files are created for each disk array.
nnn	This is a file serial number (between 2 and 999). If a file with the same name exists when accumulation of statistic information starts up, a serial number is assigned. For example, if the iSM server is shut down and started up in operation of one day, the serial number is assigned to accumulated statistic information from the second startup of the iSM server, and the value increments by one. The serial number has the upper limit. If the number exceeds this limit, accumulation of statistic information fails.

If an operation that results in the serial number exceeding the maximum is performed, move the statistic information history files to the different directory at each shutdown of the iSM server, or summarize/extract statistic information as required, delete the statistic information history files. Then, restart the iSM server.

For information on how to estimate the size of a statistic information history file, refer to Appendix E “Estimating Size of Files for Performance Monitoring Function”.

The accumulating period of statistic information is called the logging interval. The user can specify the logging Interval from 1 minute to 60 minutes at environment definition of the iSM server. The logging Interval cannot be changed while the iSM server is operating. To change the logging Interval, you must terminate the iSM server.

The accumulating processes of statistic information limits the number of times for collecting statistic information within a specified time, in order not to affect I/O process from the application server. In other words, the statistic information is not collected all at once from the disk array, but it is collected with dividing the accumulating process into several intervals. Therefore, too many disk array components may prevent collecting statistic information within a specified logging interval, and may disable starting of the data accumulation process. In such a case, specifying the automatic adjustment of logging interval in the environment definition of the iSM server can adjust the appropriate intervals within a range of 60 minutes from the interval set in the environment definition, and start accumulating processes. When a logging interval is automatically adjusted, a message notifies the adjustment.

NOTE: Effect of statistic information collection on storage units. When it is determined that there area many disk array components and the number of times for collecting statistic information is a lot, message iSM08051 is displayed. If this message is displayed, make a logging interval longer.

The monitored disk arrays collect various types of statistic information by component/load type in the unit of summarizing. From the statistic information, iSM reads the statistic information of the types shown in Tables A-3 to A-11 in A 3.1 and accumulates the time changes in the statistic information history file. Such statistic information is called basic statistic information.

The information output on a specific resource basis is called additional statistic information, and is described in the form of “resource-name (additional-information).”

iSM also records information required for displaying the following information in the statistic information history file.

- Component information required interpreting accumulated statistic information
- Name tags used for displaying the results of analysis

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Summarizing Statistic Information

The statistic information accumulation function described above accumulates statistic information collected in every logging Interval in statistic information history file. If statistic information collected in relatively short intervals is accumulated in the long term, the amount of data in the statistic information history file will become enormous and eventually exhaust the free disk space.

For saving disk space, the accumulated statistic data is summarized into the information of a period longer than the logging interval, reducing amount of information included in a file, downsizing the data. This function is called summarizing statistic information. The information after summarizing is output to statistic information summarized file. For details about summation, refer to A.3.1"Summarizing Statistic Information".

When you want to accumulate statistic information in the long term, summarize statistic information by using this function as required and delete the statistic information originally accumulated. This can save the disk space. For information on how to estimate the size of a statistic information summarized file, refer to Appendix E "Estimating Size of Files for Performance Monitoring Function".

Types of summarized files.

In order to select an appropriate balance between the time resolution and amount of accumulated information. You can create summarized files whose average time interval in the period of summarizing is one hour and summarized files whose average time interval is one day.

A file which contains statistic information summarized in units of hours is called a primary summarized file, and file which contains statistic information summarized in units of days is called a secondary summarized file. In other words, iSM has three types of files which store statistic information, as shown in Table 1-2.

Type of File	Average Time Interval of Period of Summarizing	Amount Recorded in One File
Statistic Information History File	Logging Interval	For max. of one day
Statistic Information Primary Summarized File	One hour	For max. of one day
Statistic Information Secondary Summarized File	One day	For max. of one month

NOTE: If the disk array configuration is changed while the statistic information is being accumulated, the period of summarizing is divided at the time when the disk array configuration is changed.For the statistic information on primary summarized file, the period of summarizing might be less than one hour by being divided at the time when the disk array configuration is changed.For the statistic information on secondary summarized file, the period of summarizing might be less than one day by being divided at the time when the disk array configuration is changed.

Types of summarizing operations.

- iSM provides the following three types of summarizing functions to deal with the two types of summarized files.
- History file → Primary summarized file (primary summarizing)

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- The input is a statistic information history file, and the output is a primary summarized file. In other words, statistic information in each logging interval within each period of summarizing in the input file is summarized in units of hours and the result is recorded in the output file.
- History file → Secondary summarized file (direct secondary summarizing)
- The input is a statistic information history file, and the output is a secondary summarized file. In other words, statistic information in each logging interval within each period of summarizing in the input file is summarized in units of days and the result is recorded in the output file.
- Primary summarized file → Secondary summarized file (secondary summarizing)
- The input is a primary summarized file, and the output is a secondary summarized file. In other words, statistic information in each hour within each period of summarizing in the input file is summarized in units of days.
- For the enhanced statistic information, the maximum and minimum values are selected from the enhanced statistic information of the same type recorded in the primary summarized file.

Auto Archive.

- Statistic information can be summarized automatically at fixed intervals.
- By summarizing statistic information automatically, the following two summarized files are periodically created in the "archive" folder under the statistic information storage folder of the iSM server. The "archive" folder is automatically created by the iSM server.
- Statistic information primary summarized file
- The statistic information history file of the previous day is summarized daily at a time set in the environment definition of the iSM server.
- Statistic information secondary summarized file
- The statistic information primary summarized file of the previous month is summarized at the start of every month at a time set in the environment definition of the iSM server.

Auto archive is executed under the following cases:

- When auto archive execution is enabled in the environment definition of the iSM server.

For the environment setting of the iSM server, refer to the installation guide.

- When the license of the data allocation optimization function is applied.

To execute auto archive, disk capacity for the statistic information primary/secondary summarized files must be reserved in addition to the statistic information history file. Therefore, the disk capacity may be overloaded unless statistic information is deleted periodically. To prevent the disk capacity from being overloaded, it is effective to set the keep period of statistic information.

Files under the statistic information storage folder of the iSM server are targeted for auto archive. Therefore, take extra care when storing files in the folder under the statistic information storage folder.

Auto archive is not executed when the iSM server is stopped at auto archive execution. In this case, the summarized file that was not created last time is created at auto archive execution after the iSM server restarting.

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Keep Period of Statistic Information

The disk capacity will overload by continuing to accumulate statistic information. Therefore, you need to delete statistic information as appropriate. This function periodically deletes the unnecessary statistic information by setting the period (keep period) to save the statistic information file. The statistic information files are targeted for deletion when the number of days/months/years elapsed since the day the statistic information was collected has exceeded the set keep period.

Different keep periods can be set to statistic information files the according to their file types. The keep period of statistic information can be set in the environment definition of the iSM server. For the environment setting of the iSM server, refer to the installation guide.

The targets for deletion are statistic information files created under the statistic information storage folder of the iSM server or in the archive folder under the statistic information storage folder. Therefore, take extra care when storing files in each folder.

The target files for deletion are determined based on the system time of the machine where iSM server is operating. Therefore, take extra care when changing the system time. When you want to change the system time substantially, you must save the statistic information files as required.

NOTE: If the iSM server is stopped when file deletion is executed, the statistic information files that have exceeded the keep period are not deleted. The files will be deleted at deletion after the iSM server restarting.

Downloading Statistic Information

The statistic information accumulated on the iSM management server can be summarized, extracted, and edited by downloading the statistic information file on the iSM client. If you do not have the iSM performance analysis supporting tool and iSM Storage Performance Report Viewer in the iSM client environment, you have to install them. For details on the installation procedure, refer to the installation guide.

The statistic information file can be downloaded from the Performance Monitoring screen on the iSM client by using the iSM file transfer function. Downloading is allowed for clients of user level L2 or L3. Downloading is also allowed with a commercially available FTP tool without using the iSM file transfer function.

Extracting Statistic Information

Statistic information about disk array collected by iSM is accumulated in statistic information history files and statistic information summarized files. This function can extract and output the information to a CSV format file (delimited by commas).

Use of this function allows displaying values of accumulated statistic information. Furthermore, a spreadsheet program can display the data of CSV format file in graphs, allowing review of long-term load fluctuation and performance analysis.

By specifying addition of header upon extracting a CSV file, the header record for the values is added to top of the file. Editing the statistic information with a header record using a spreadsheet program allows easy identification of the statistic data values.

CSV Conversion Tool creates CSV files according to the following naming convention. For information on the structure of a CSV file, refer to Appendix C “CSV File Structure”.

Naming Convention for CSV Files

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```
"Name of Statistic Information History (summarization) File"_"Extension
of Statistic Information History (summarization) File".csv
```

Example: Name of the CSV file for the statistic information file "20070417StorageD8.psl"

```
20070417StorageD8_psl.csv
```

In statistic information history/summarized files, various types of statistic information regarding components of the disk array are accumulated. You can extract the specified statistic information from the statistic information by giving extraction conditions to CSV Conversion Tool depending on your purpose. The following extraction conditions can be specified for CSV Conversion Tool.

- Period of extraction
- Component of disk array
- Type of statistic information

In statistic information history/summarized files, the component information of the disk array is accumulated in addition to statistic information. CSV Conversion Tool can also extract component information.

1. Extracting statistic information in the specified period.

   To extract statistic information in the specified period, specify the period in CSV Conversion Tool. To specify a period, you can specify the extraction starting time and end time, or either one of them.

   a. Specifying the extraction starting time and end time

   b. Statistic information from the extraction starting time to the extraction end time is extracted. (ii)Specifying the extraction starting time only Statistic information after the extraction starting time is extracted.

   c. Specifying the extraction end time only

   Statistic information before the extraction end time is extracted.

2. **Extracting statistic information regarding the specified component**.

   To extract statistic information of the specified component of the disk array, specify the component of the disk array in CSV Conversion Tool. The following components can be specified.

   - Host director
   - Disk director
   - Host port
   - Host port (node)
   - Replication port
   - Data migration port
   - Disk port
   - Cache
   - Cache segment
   - Logical disk
   - Physical disk
   - RANK
   - Pool

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- Semi synchronous copy order guarantee buffer information
- Logical disk (capacity) information
- Pool (capacity) information
- Concentrator
- Cabinet (DAC, DE)

3. Extracting statistic information of the specified type.

   Statistic information can be generally categorized into the following types.

   - Information regarding the number of inputs/outputs

     This information contains the number of inputs/outputs, the maximum values of input/output density

     (IOPS) and minimum values of input/output density.
   - Information regarding the response time of the I/O process

     This information contains the average response time and the maximum response time.
   - Information regarding the Transfer Rate of the I/O process

     This information contains Transfer Rate and the maximum and minimum values of Transfer Rate.
   - Information regarding the operating status of the devices

     Busy time and maximum and minimum values of the busy time are included. A Busy Ratio and maximum and minimum values of the Busy Ratio are included.
   - Information regarding the I/O request queues

     Average queue length and max queue length are included.
   - Information regarding the cache pages

     Average dirty pages and max dirty pages are included.
   - Information regarding the wait time of the semi synchronous copy order guarantee buffer

     Average wait time and max wait time are included.
   - Information regarding the electric power

     Electric power value and electric energy are included

4. Extracting configuration information.

   a. There are the following types for configuration information of a disk array. Information regarding the disk array and configurations

      Information regarding:

      - Disk array
      - Node
      - Host director
      - Disk director
      - Host port
      - Replication port
      - Data migration port
      - Disk port
      - Cache

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- Cache segment
- Logical disk
- Physical disk
- ANK
- Pool
- Cabinet

a. Information regarding changes in logical disk names

This is information regarding changes in logical disk names.

b. Information regarding changes in disk array configuration

This is information regarding changes in disk array configuration.

c. Information regarding changes in RANK configuration

This is information regarding Logical Disk moving between RANKs by the performance optimization function.

To extract (i) and (ii), you must specify extraction of configuration information in CSV Conversion Tool. (iii) and (iv) is always extracted regardless of specification to CSV Conversion Tool. When configuration of the disk array and RANK changes, statistic information before and after the change are no longer related. Therefore, you must consider the following to analyze statistic information. When information (iii) is output, statistic information regarding all configuration s collected before and after the output is no longer related. When information (iv) is output, only statistic information on the RANK and pool collected before and after the output is no longer related

Editing Statistic Information

As described in 1.5.3.5 “Extracting Statistic Information”, a user can create CSV format files using the CSV conversion tool, and can edit the data using spreadsheet software as required. This process makes analysis of the statistic information easier.

Furthermore, use of the functions provided by iSM allows easy analysis without a spreadsheet program. iSM provides the following edit functions for statistic information:

- A program called Performance Report Editor for the user to edit/modify in a format easy for performance analysis and output to a file the statistic information accumulated in statistic information history files and statistic information summarized files.
- Function of displaying graphs (Storage Performance Report Viewer) for files created with the edit tool (performance report).

1. Performance Report Editor

The Performance Report Editor uses statistic information in statistic information history/summarized files as inputs and edits/modifies the statistic information into a text-format Performance Report. The user can reference the Performance Report to readily analyze the performance of a disk array.

Types and overview of Performance Report are given below. For details on the Performance Report, refer to Appendix D “Report Format of Performance Report Editor”.

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a. Performance Summary Report.

The Performance Summary Report is a component-based summary of statistic information on:

- Whole disk array
- Node
- Host directors
- Disk directors
- Host ports
- Replication ports
- Disk ports
- Caches
- Cache segments
- Logical disks
- Physical disks
- RANKs
- Pools

Analysis of the Performance Summary Report provides understanding of general load status in the entire disk array and each component of the statistic information collection period.

b. Performance Detail Report

The Performance Detail Report summarizes the following statistic information per statistic information logging Interval of the iSM and is assigned chronologically:

- Whole disk array
- Node
- Host directors
- Disk directors
- Host ports
- Replication ports
- Disk ports
- Caches
- Cache segments
- Logical disks
- Physical disks
- RANKs
- Pools

Analysis of the Performance Detail Report provides understanding of chronological change in the load status of the entire disk array and each component as well as detection of a performance bottleneck. There are the following 14 types of the performance detail reports.

- Disk array performance detail report
- Node performance detail report

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- Host director performance detail report
- Disk director performance detail report
- Host port performance detail report
- Replication port performance detail report (initiator)
- Replication port performance detail report (target)
- Disk port performance detail report
- Cache performance detail report
- Cache segment performance detail report
- Logical disk performance detail report
- Physical disk performance detail report
- RANK performance detail report
- Pool performance detail report

The Performance Report Editor creates a performance report in accordance with the following naming rule:

- When input is a statistic information history file (xxxxxx.psl):

xxxxxx_psl_edit type.txt

- When input is a statistic information summarized file (xxxxxx.psa):xxxxxx_psa_edit type.txt

One of the following is set in the "edit type" depending on the performance report type:

Edit Type	Report Type
sum	Performance summary report
array	Disk array performance detail report
node	Node performance detail report
hd	Host director performance detail report
dd	Disk director performance detail report
hp	Host port performance detail report
rp-i	Replication port performance detail report (initiator)
rp-t	Replication port performance detail report (target)
dp	Disk port performance detail report
cache	Cache performance detail report
cheseg	Cache segment performance detail report
ld	Logical disk performance detail report
pd	Physical disk performance detail report
rank	RANK performance detail report
pool	Pool performance detail report

2. Storage Performance Report Viewer

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The Storage Performance Report Viewer is a tool that uses a disk array performance detail report created by the Storage Performance Report Editor as inputs to provide graphic representation of statistic information. The user references a graph to understand the load state of disk array and chronological change in the load.

The Storage Performance Report Viewer can be used in an environment where Excel (Microsoft® Excel2000/2002/2003/2007/2010) is installed.

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Appendix A

Specifications

The specifications of the disk array are shown below.

Table A-1: Specifications - Disk Array

	SnapSAN 3000	SnapSAN 5000
Host interface	(A) Fibre channel (FC-AL / Fabric): • Maximum transfer rate: 8 Gbps (B) iSCSI: • Maximum transfer rate: 1 Gbps • Maximum transfer rate: 10 Gbps (Fibre)	(A) Fibre channel (FC-AL / Fabric): • Maximum transfer rate: 8 Gbps (B) iSCSI: • Maximum transfer rate: 1 Gbps Maximum transfer rate: 10 Gbps (Fibre)
CONTnumber per unit	2	2
Number of host ports per CONT	(A) 4	(A) 4
	(B) 2	(B) 2
Cache memory capacity per unit	8 GB	8GB (initial) 16 GB (when memory added)
Backup time for cache memory	Unlimited	Unlimited
DEs per unit	3.5-inch DE: Max. 7 2.5-inch DE: Max. 3	3.5-inch DE: Max. 7 2.5-inch DE: Max. 5
Number of disk drives	3 to 96	3.5-inch disk drive: 3 to 96 2.5-inch disk drive: 3 to 144
Disk drive	3.5-inch SAS (15Krpm): 300 GB, 450 GB, 600 GB (standard), 600 GB (encryption) 3.5-inch NL-SAS (7.2Krpm): 1 TB, 2 TB 3.5-inch SSD: 400 GB 2.5-inch SAS (10Krpm): 300 GB, 450 GB, 600 GB (standard), 600 GB (encryption) 2.5-inch NL-SAS (7.2Krpm): 1 TB 2.5-inch SSD: 10 0GBß	3.5-inch SAS (15Krpm): 300 GB, 450 GB, 600 GB (standard), 600 GB (encryption) 3.5-inch NL-SAS (7.2Krpm): 1 TB, 2 TB 3.5-inch SSD: 400 GB 2.5-inch SAS (10Krpm): 300 GB, 450 GB, 600 GB (standard), 600 GB (encryption) 2.5-inch NL-SAS (7.2Krpm): 1 TB 2.5-inch SSD: 10 0GBß
Disk interface	SAS: Maximum transfer rate: 6 Gbps	SAS: Maximum transfer rate: 6 Gbps
RAID type	RAID-10, 50, 60, TM	RAID-10, 50, 60, TM

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Specifications of the RAID configurations are shown below.

Table A-1: Specifications - RAID Configurations

RAID type	RAID components	Number of disk drives	Storage efficiency
RAID-10	(1D+1D)× n	2 or more	50%
RAID-50	(2D+P)× n	3 or more	66%
	(4D+P)× n	5 or more	80%
	(8D+P)× n	9 or more	88%
RAID-60	(4D+PQ)× n	6 or more	66%
	(8D+PQ)× n	10 or more	80%
RAID-TM	1D+1D+1D	3	33%

IMPORTANT: It is recommended that you use disk drives of the same capacity and rotational frequency for RAID systems. D refers to data disk; P and Q refer to parity disks where n is an integer greater than 1.

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Appendix B Windows FC/SAS Application Server

This appendix provides the steps you should follow while setting or checking application server in the Windows environment, when the disk array is configured for a FC or SAS connection.

Installing SnapSAN Manager Agent Utility

This section describes how to install SnapSAN Manager Agent Utility.

Before Installation

Note the followings before installing the SnapSAN Manager Agent Utility. The following functions become available by installing the SnapSAN Manager Agent Utility.

- iSM volume list command.
- Host agent (Host information collection command and host agent service) (*1)
- iSCSI Setup Tool (*2)
- SnapSAN Host Register Agent (*3)

*1 Available in Windows Server 2003 SP 1 or later environments.
*2 Available in Windows Server 2008 or later environments.
*3 Available in Windows Server 2003 or later environments.

Table B-1 shows the supported operating environment:

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Table B-1: Operating System and Environments

Systems	Supported Environments
Operating Systems	Microsoft Windows Server 2003, Standard Edition (SP0 to SP2) (*1) Microsoft Windows Server 2003 R2, Standard Edition (SP0, SP2) Microsoft Windows Server 2003, Standard x64 Edition (SP0, SP2) Microsoft Windows Server 2003 R2, Standard x64 Edition (SP0, SP2) Microsoft Windows Server 2003, Enterprise Edition (SP0 to SP2) (*1) Microsoft Windows Server 2003 R2, Enterprise Edition (SP0, SP2) Microsoft Windows Server 2003, Enterprise x64 Edition (SP0, SP2) Microsoft Windows Server 2003 R2, Enterprise x64 Edition (SP0, SP2) Microsoft Windows Server 2003, Enterprise Edition for Itanium-based Systems (SP0 to SP2) (*1) (*5) Microsoft Windows Server 2008 Standard (SP0, SP2) (*2) (*3) (*4) Microsoft Windows Server 2008 R2 Standard (SP0, SP1) (*2) (*4) Microsoft Windows Server 2008 Enterprise (SP0, SP2) (*2) (*3) (*4) Microsoft Windows Server 2008 R2 Standard (SP0, SP1) (*2) (*4) Microsoft Windows Server 2008 for Itanium-based Systems (SP0, SP2) (*5) (*1) To use the host information collection function included in SnapSAN Manager Agent Utility, SP1 or SP2 must be applied on this OS. (*2) The product without Hyper-V function is also supported. (*3) The Server Core install option is not supported. (*4) The iSCSI Setup Tool (sharing function) can be used on the SnapSAN 5000 disk arrays. This tool supports Windows Server 2008 or later. The 32-bit version of Java Runtime Environment (JRE) must be installed to use this function. (*5) The SnapSAN 5000 does not support Microsoft Windows Server 2003, Enterprise Edition for Itanium-based Systems, and Microsoft Windows Server 2008 for Itanium-based Systems.

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Table B-1: Operating System and Environments

Systems	Supported Environments
Memory	Microsoft Windows Server 2003, Standard Edition
	OS required memory + 10 MB or more
	Microsoft Windows Server 2003 R2, Standard Edition
	OS required memory + 10 MB or more
	Microsoft Windows Server 2003, Standard x64 Edition
	OS required memory + 12 MB or more
	Microsoft Windows Server 2003 R2, Standard x64 Edition
	OS required memory + 12 MB or more
	Microsoft Windows Server 2003, Enterprise Edition
	OS required memory + 10 MB or more
	Microsoft Windows Server 2003 R2, Enterprise Edition
	OS required memory + 10 MB or more
	Microsoft Windows Server 2003, Enterprise x64 Edition
	OS required memory + 12 MB or more
	Microsoft Windows Server 2003 R2, Enterprise x64 Edition
	OS required memory + 12 MB or more
	Microsoft Windows Server 2003, Enterprise Edition for Itanium-based Systems
	OS required memory + 37 MB or more
	Microsoft Windows Server 2008 Standard
	OS required memory + 10 MB or more
	Microsoft Windows Server 2008 Enterprise
	OS required memory + 10 MB or more
	Microsoft Windows Server 2008 for Itanium-based Systems
	OS required memory + 37 MB or more

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Table B-1: Operating System and Environments

Systems	Supported Environments
Operating systems	Microsoft Windows Server 2003, Standard Edition (SP0 to SP2) (*1) Microsoft Windows Server 2003 R2, Standard Edition (SP0, SP2) Microsoft Windows Server 2003, Standard x64 Edition (SP0, SP2) Microsoft Windows Server 2003 R2, Standard x64 Edition (SP0, SP2) Microsoft Windows Server 2003, Enterprise Edition (SP0 to SP2) (*1) Microsoft Windows Server 2003 R2, Enterprise Edition (SP0, SP2) Microsoft Windows Server 2003, Enterprise x64 Edition (SP0, SP2) Microsoft Windows Server 2003 R2, Enterprise x64 Edition (SP0, SP2) Microsoft Windows Server 2003, Enterprise Edition for Itanium-based Systems (SP0 to SP2) (*1) (*5) Microsoft Windows Server 2008 Standard (SP0, SP2) (*2) (*3) (*4) Microsoft Windows Server 2008 R2 Standard (SP0, SP1) (*2) (*4) Microsoft Windows Server 2008 Enterprise (SP0, SP2) (*2) (*3) (*4) Microsoft Windows Server 2008 R2 Standard (SP0, SP1) (*2) (*4) Microsoft Windows Server 2008 for Itanium-based Systems (SP0, SP2) (*5) (*1) To use the host information collection function included in SnapSAN Manager Agent Utility, SP1 or SP2 must be applied on this OS. (*2) The product without Hyper-V function is also supported. (*3) The Server Core install option is not supported. (*4) The iSCSI Setup Tool (sharing function) can be used on the SnapSAN 5000 disk arrays. This tool supports Windows Server 2008 or later. The 32-bit version of Java Runtime Environment (JRE) must be installed to use this function. (*5) The SnapSAN 5000 does not support Microsoft Windows Server 2003, Enterprise Edition for Itanium-based Systems, and Microsoft Windows Server 2008 for Itanium-based Systems.

* Above are the supported environments for this version at the point of the initial shipment of this product.

Installation

Use SnapSAN Manager Setup to install the SnapSAN Manager Agent Utility.

SnapSAN Manager Setup starts automatically when the SnapSAN 3000/5000 Documentation Software CD is set and then you can perform installation as prompted.

The procedure for starting the SnapSAN Manager Setup is:

1. Logon as administrator.
2. Set the CD-ROM of SnapSAN Manager in an application server.
3. The SnapSAN Manager Setup starts automatically. Perform the installation as prompted.

The SnapSAN Manager Setup may not start automatically depending on your system configuration, in which case, start the following program contained in the CD-ROM:

```
\INSTALL\WINDOWS\ISMSETUP.EXE
```


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CAUTION: After the SnapSAN Manager Agent Utility is installed, the system needs to be restarted to start the SnapSAN Manager host agent service.

Collecting/Registering Host Information on Application Server

The procedure described below is not supported by the disk arrays connected via SAS.

Collecting Host Information by Using File Output

To collect host information by using file output, follow the procedure below.

1. Run the host information collection command (`iSMcc_hostinfo`) from the command prompt. For the `-export` option, specify a file (host information file) to which host information will be reported.

   Run the host information collection command (`iSMcc_hostinfo`) as a user privileged as Administrator.

   D:\> iSMcc_hostinfo -export \ServerName

   iSMcc_hostinfo: Info: iSM11700: Please wait a minute.

   iSMcc_hostinfo: Info: iSM11770: Host Information was exported successfully. (code=

   aaaa-bbbb-bbbb-bbbb)

   iSMcc_hostinfo: Info: iSM11100: Command has completed successfully.

2. Confirm the result of running the command.

   After running the host information collection command (`iSMcc_hostinfo`), confirm that the message No. iSM11770 is reported and the host information is successfully collected. "aaaa" in the message example above is replaced with a process number and "bbbb" with an internal code for maintenance in the actual message.

3. Transferring the host information file

   Transfer the host information file reported by using the host information collection command (`iSMcc_hostinfo`) to a client by using file transfer, USB memory, or other methods.

To register host information files transferred to clients, see *Section : "Registering Host Information by Using File Output"*.

Registering Host Information by Using File Output

To register host information by using file output, follow the procedure below.

1. Report a host information file.

   See *Section : "Collecting Host Information by Using File Output"* to report a host information file.

2. Transfer the host information file to a client.

   Use file transfer, USB memory or other methods to transfer the host information file to a client.

3. Register the host information by using SnapSAN Manager.

   On the left pane on the SnapSAN Manager window, click **Configuration**, **Host** and **Host Information Collection** to open the Host Information Registration window.

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4. Select **host information setting method**.
5. Select the **Update with host information file. (Windows, Linux or Hyper-V)** option and click **Next**.
6. Specify the host information file.
   a. Click **Show collected information** to specify the file in which host information is recorded and click **Add**.
   b. Confirm that all the host information is retrieved and click **Next**.
   This displays the Host information collection completion window.
7. The result of setting host information is displayed. Click **Finish** to close the page.

Checking Connection from Application Server

This section describes how to check connection under a Windows environment and check the Path Manager settings and status.

Check connection under a Windows environment

After confirming that the application server and disk array controller are connected through an FC cable, restart the server and perform the following checks.

1. To start, select **Administrative Tools > Computer Management > Device Manager**.
2. Click **Disk drives** and check the number of logical disks.

Display example: When four logical disks are assigned to a server.

CAUTION: If nothing is displayed, the OS was unable to recognize logical disks in the disk array assigned to a server. Check the connection between the server and disk array controller, the Access Control settings, host bus adapter driver settings, etc.

3. Open **Disk Management** and check the number of logical disks assigned to a server.

Check the Path Manager Settings and Status

When Path ManagerPath Manager is not used, it is not necessary to perform this step.

After checking the FC cable connection between the application server and disk array controller, restart the server and run the following command from the command prompt.

IMPORTANT: For details, refer to the *Path Manager User's Guide (Windows Version)*.

Check Path Manager status

Run the following command from the command prompt.

```
spsadmin /lun
```

Check the message shown after the command is executed, and then check the number of logical disks assigned to the server, the number of access paths per logical disk, and each path status.

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Display example: When two logical disks are assigned to a server, with two access paths per logical disk.

```
C:\>spsadmin /lun

+++ LogicalUnit #0 +++
 SerialNumber="0000000995000001", LDNumber=0x00000
 LoadBalance=Least Size
 0: ScsiAddress=2:0:0:0, Priority=1, Status=Active
 1: ScsiAddress=3:0:0:0, Priority=2, Status=Standby

+++ LogicalUnit #1 +++
 SerialNumber="0000000995000001", LDNumber=0x00001
 LoadBalance=Least Size
 0: ScsiAddress=2:0:0:1, Priority=1, Status=Active
 1: ScsiAddress=3:0:0:1, Priority=2, Status=Standby
```

CAUTION: If nothing is displayed, none of the access paths recognized the logical disks of the disk array controller assigned to the application server. Check the connection between the application server and the disk array controller, the Access Control settings, host bus adapter driver settings, and other settings.

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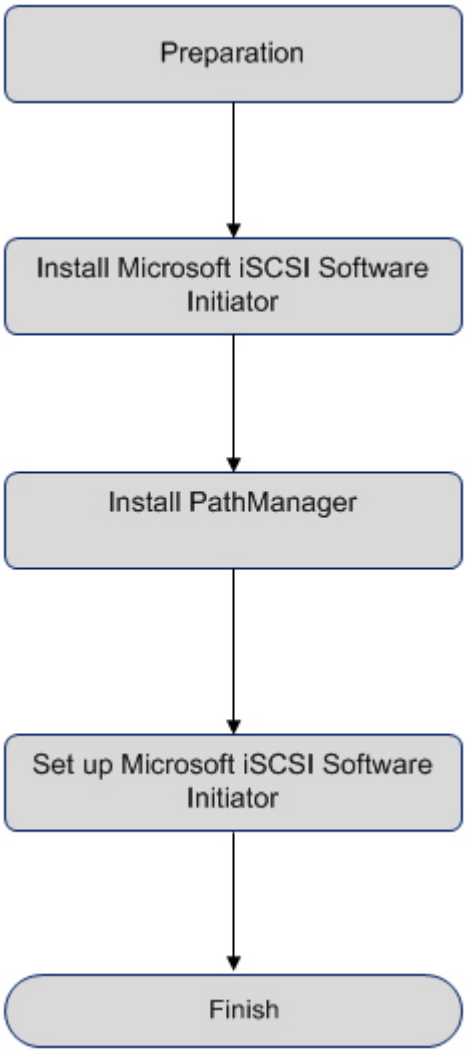
Windows iSCSI Application Server

Initializing Application Server

Perform the following steps to initialize the application server in Windows environments.

Table C-1: Application Server Initiation

Process Flow	Description
	Prepare for installation. For details, refer to *Section : Preparation*. Install Microsoft iSCSI Software Initiator. For details, refer to *Section : Installing iSCSI Software Initiator*. If Microsoft iSCSI Software Initiator has already been installed, this step is not necessary. Install Path Manager. For details, refer to *Section : Installing Path Manager*. When Path Manager will not be used, this step is not necessary. This describes how to set up Microsoft iSCSI Software Initiator. For details, refer to *Section : Setting up iSCSI Software Initiator*.

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Preparation

Perform the following steps to prepare for installation of application server in Windows environment:

1. Provide IP addresses for an application server.

Prepare IP addresses to be assigned to the application server as many as the NIC (1000BASE-T or 10GBASE-SR) ports. In addition, prepare the subnet mask and gateway addresses by asking the network administrator.

CAUTION: If two or more IP addresses are used by Path Manager, the same network segment cannot be specified. Prepare IP addresses of other segments.

Example 1: Connectable configuration
HP0:192.168.0.10
HP1:192.168.1.10

Example 2: Unconnectable configuration
HP0:192.168.0.10
HP1:192.168.0.11

2. Attach NIC (1000BASE-T or 10GBASE-SR).

Attach the NIC to the application server as described in the manuals provided with the NIC and application server.

NOTE: If the NIC has already been attached to the application server, this step is not necessary.

3. Install the NIC (1000BASE-T or 10GBASE-SR) driver.

Install and set up the driver according to the setup procedure in the manual provided with the NIC equipped in the server, or by referencing information provided on the Web, etc.

NOTE: If the driver has already been installed and set up for the NIC equipped in the application server, this step is not necessary.

4. Specify the network settings.

Select **Start > Control Panel > Network Connection**, and then open **Local Area Connection Properties** to specify the IP address, subnet mask, and default gateway.

5. Connect to the disk array controller.

Use a 10-Gbps or 1-Gbps cable to connect the application server to the host port (HP connector) of the disk array controller.

- Unit equipped with 10Gbps iSCSI 2port controllers 10-Gbps cable

  Connector shape: LC connector

NOTE: FC cable can be used.

- Unit equipped with 1Gbps iSCSI 2port controllers 1-Gbps cable

  Connector shape: RJ-45 connector

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NOTE: CAT6 LAN cable is recommended.Either straight cable or crossover cable can be used.

For a sample connection configuration, see *Appendix L: "iSCSI Connection Configuration-Examples"*.

The following shows the positions of the host ports.

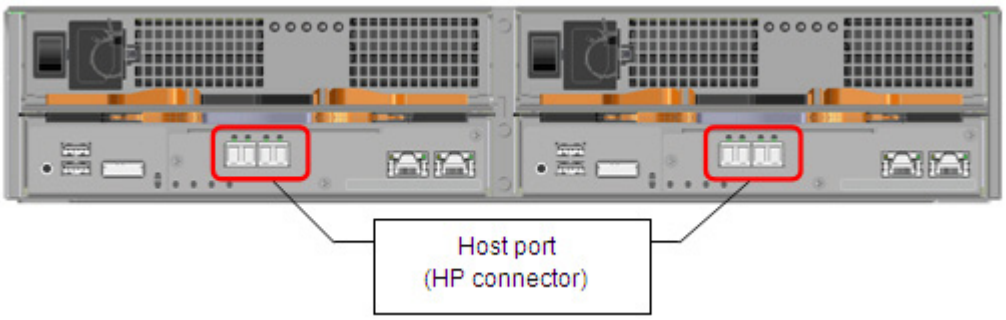

Figure C-1: Unit with 10Gbps iSCSI 2port Controllers

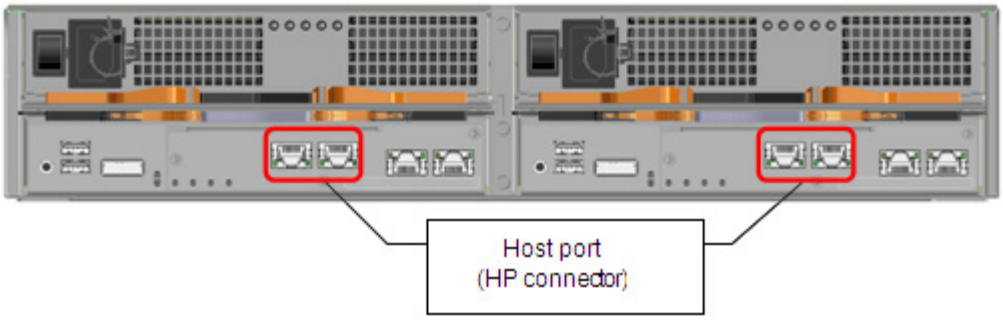

Figure C-2: Unit with 1Gbps iSCSI 2port Controllers

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The following shows an example of a 10-Gbps iSCSI connection (redundant path configuration in combination with Path Manager).

To implement the following recommended example, two NICs must be installed in the application server and two 10-Gbps cables are needed to connect the disk array controller and NICs.

Use a 10-Gbps cable to connect the NIC to the host port (HP connector) of the disk array controller. (The 10-Gbps cable has the same connector shape on both ends.)

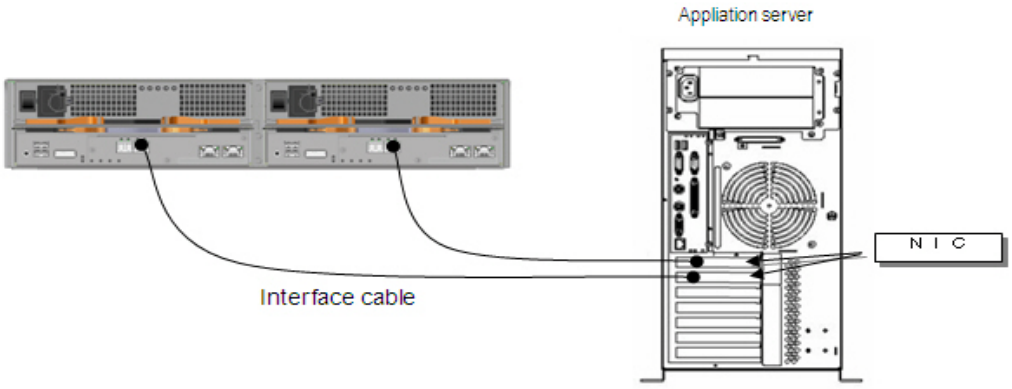

Figure C-3: Configuration Example

Installing iSCSI Software Initiator

Perform the following steps to install iSCSI Software Initiator in Windows Server 2008 or Windows Server 2003 environments:

Windows Server 2008

Windows Server 2008 have the iSCSI Software Initiator already installed, so there are no installation steps. Select **Start** > **Administrative Tools**, and then start iSCSI Initiator.

The following dialog boxes are displayed only during initial startup. After the service is started, if there are no problems with the firewall settings, click the **Yes** button in each screen.

Windows Server 2003/Windows Server 2003 R2

Perform the following steps to install the initiator in Windows Server 2003 or Windows Server 2003 R2 environment:

1. Download the Microsoft iSCSI Software Initiator from the Microsoft website (*http://www.microsoft.com/downloads/*).
2. The following screen is displayed when installation of the Microsoft iSCSI Software Initiator begins.
3. Click the **Next** button.
4. After changing the settings as follows, click the **Next** button.
   - Select the **Initiator Service** option.
   - Select the **Software Initiator** option.
   - Deselect the **Microsoft MPIO Multipathing Support for iSCSI** option.

NOTE: When Path Manager is being used, the MPIO function cannot be used.

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5. If you agree to the terms of the license agreement, select **I Agree**, and then click the **Next** button.
6. The following dialog box appears next. No more user input is needed until installation is completed.
7. Click the **Finish** button to restart the server.
8. After the server is restarted, the Microsoft iSCSI Initiator icon appears on the desktop.

Installing Path Manager

See *Section : For Windows Application Server* for installation procedure.

This operation is not necessary if you do not install Path Manager.

CAUTION: When using Path Manager, MPIO function of the iSCSI Software Initiator cannot be used. If the iSCSI Software Initiator has already been installed and MPIO function is set to enabled, you must uninstall the iSCSI Software Initiator. Then reinstall the iSCSI Software Initiator with the setting not using MPIO function.

Setting up iSCSI Software Initiator

Settings for the Windows Server 2008 environment are described below.

1. Select the **General** tab in the iSCSI Initiator Properties screen to check the iqn (iSCSI Qualified Name) shown as the Initiator name.
   - Click the **Change** button to change the iqn.
   - Click the **Secret** button when using the mutual CHAP authentication.
   - Click the **Setup** button when using the IPSec tunnel mode function. This is not supported.

CAUTION: The Secret setting for mutual CHAP authentication must also be set for the disk array controller. The setting method is described in *Section 13.2.21: iSMcfgsetIdsetchap of SnapSAN ManagerCommand Reference*.

Mutual CHAP authentication is also described in *SnapSAN Manager Command Reference* as Bidirectional CHAP authentication.

CHAP authentication is also described in *Appendix O: "CHAP Authentication"*

2. If mutual CHAP authentication will be used, click the **Secret** button.If mutual CHAP authentication will not be used, skip step (3) and move to step (4) below.Under **CHAP Secret**, enter the password assigned to Initiator for use in mutual CHAP authentication, and then click the **OK** button.

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CAUTION:
The CHAP Secret can be specified as any string of 12 to 16 alphanumeric characters as well as !#$%&'*+~/=?{|}_.-. Letters are case-sensitive. For security, password text strings are indicated as ● or other symbols.

Mutual CHAP authentication is also described in *SnapSAN Manager Command Reference* as **Bidirectional CHAP authentication**.

The CHAP Secret that is set here is a password that a target uses to authenticate the Initiator. This password is also required for settings on the disk array side (see *Section: 13.2.21 iSMcfg setIdsetchap in the SnapSAN Manager Command Reference*), so be sure to write it down so it is not forgotten.

3. Perform the iSCSI Initiator Properties Discovery tab settings using any of the following options:
   - Settings when not using iSNS (Internet Storage Name Service) server
   - Settings when using the iSNS (Internet Storage Name Service) server

Settings when not using iSNS (Internet Storage Name Service) server

Perform the following settings:

a. Under the **Discovery** tab in **iSCSI Initiator Properties**, click the **Add Portal** button under **Target Portal**Enter the IP address of the disk array host port (iSCSI port) under **IP address or DNS name**. Make sure the entry is correct, and then click the **OK** button.

NOTE: Do not change the Port setting 3260.

a. The following pop-up window may appear, but it does not affect operations.

b. Click the **OK** button.

c. To make the host port (iSCSI port) on the disk array of a redundant configuration, perform steps (a) to (c) above for each additional host port.

4. When settings are completed, a screen such as the following is displayed. Click the **OK** button.

Example: When two Target Portal IP addresses have been registered.

Settings when using iSNS (Internet Storage Name Service) server

CAUTION: Microsoft iSNS Server must be installed in a Windows server on the same network as the application server.

For detailed description of iSNS server, refer to manuals and other documents provided separately from Microsoft Corporation

Perform the following settings:

d. Under the Discovery tab in **iSCSI Initiator Properties**, click the **Add** button.Enter the IP address of the iSNS server under **IP address or DNS name of server**.

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e. Make sure the entry is correct, and then click the **OK** button

f. Repeat steps (a) and (b) above for each iSNS server IP address to be registered. When settings are completed, a screen such as the following is displayed. Click the **OK** button.

Example: When two iSNS server IP addresses are registered.

g. This gets Initiator information from the application server registered to the iSNS server.

Refer to *Appendix N: "Retrieve Initiator Information on Application Servers Registered with iSNS Server"*.

NOTE: When using the iSNS server, the Initiator name of the application server must be directly entered under the Initiator settings in the iSCSI Setup Tool.

h. Click the **OK** button.

iSCSI Setup Tool

Run the iSCSI Setup Tool on application servers to configure the iSCSI settings required for the application server. Before starting this section, you need to install SnapSAN Manager Agent Utility. For details on how to install, see Installing Manager Agent Utility.

1. Starting iSCSI Setup Tool

Click **Start > SnapSAN Manager Agent Utility > iSCSI Setup Tool** to start iSCSI Setup Tool.

2. Select the serial number of the target disk array controller from the **Serial number** box.

3. After selecting or entering the serial number, click **OK**.

When collecting the disk array controller information is successfully completed, the serial number, controllers, IP addresses of the disk array controller and their connection statuses are displayed.

4. Select a target IP addresses from the list and configure required settings. You can select multiple target IP addresses. When you want to select multiple target IP addresses, select the **Multi Path** check box.

5. After the required information is entered, click **Logon**.

6. When logging on to the target disk array is successfully complete, the message "Logon Succeeded." appears. Clicking **OK** brings you back to the logon page of the target, so click **Close** to end iSCSI Setup Tool.

CAUTION: iSCSI Setup Tool uses Java. It is necessary to install Java Runtime Environment (32-bit version) to the operation server.

The host name should be 15 bytes or less.

An error may occur and an invalid LD set may be recorded when you complete logon and retry to logon to a disk array system with the same serial number. In this case, delete the invalid LD set using SnapSAN Manager.

An application server has to be connected to both of the network connected with a

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management port of a target disk array and the network connected with a host connection port.

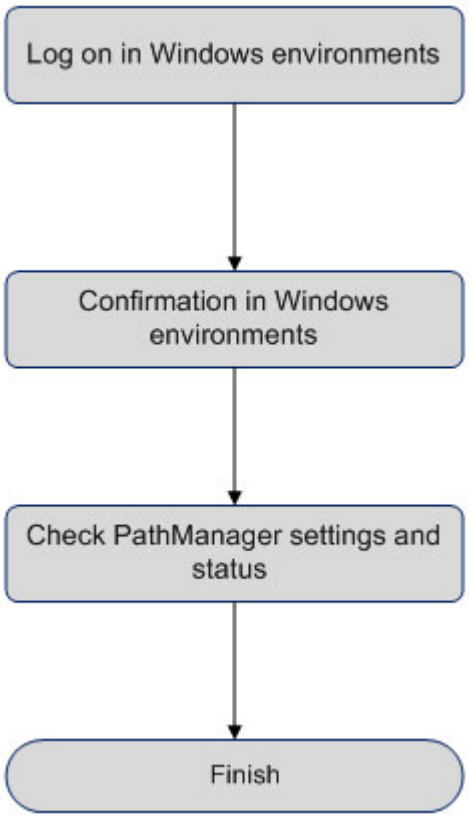
When using SnapSAN Manager (SnapSAN Manager Embedded/SnapSAN Manager), please use the iSCSI Setup Tool in the state which doesn't hold a configuration setting screen of SnapSAN Manager.

Please use the iSCSI Setup Tool in the state in which a LD set with the iqn of the same application server does not exist in the target disk array.

After setting an IP address in a host connection port or changing it, the iSCSI Setup Tool will be sometimes an error. Please re-execute the iSCSI Setting Tool in that case.

Checking Connection from Application Server

Perform the following steps to connect the application server and disk array in Windows environments.



Log on to the target.

For details, refer to *Section : Logon Steps in Windows Environments*

Confirm that the OS recognizes the logical disk.

For details, refer to *Section C.3.2: Confirmation Steps in Windows Environments*.

Check Path Manager settings and status.

For details, refer to *Section C.3.3: Check the Path Manager Settings and Status*.

If Path Manager will not be used, this step is not necessary.

Logon Steps in Windows Environments

Perform the following steps to logon to the target in the windows environment:

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1. Click the **Refresh** under the **Targets** tab in **iSCSI Initiator Properties**. Then, the Initiator name (iqn) of the disk array controller will be shown under **Targets**. Select an iqn and click the **Log on** button.
2. Change the following settings. When finished, click the **Advanced** button.

- Select the **Automatically restore this connection when the system boots** option.
- Do not select the **Enable muti-path** option.

3. Change the following settings. When finished, click the **OK** button.

Connection settings

- Select the **Microsoft iSCSI Initiator** option from the **Local Adapter** drop-down menu.
- Select the IP address of the local server from the **Source IP** drop-down menu.
- Select the IP address of the disk array host port (iSCSI port) from the **Target Portal** drop-down menu.

CHAP Authentication Settings

- Select the **CHAP logon information** option.
- Enter password to be assigned to target in the **Target Secret** box.
- Select **Execute mutual CHAP** option when using mutual CHAP authentication.

⚠ CAUTION: The CHAP Secret can be specified as any string of 12 to 16 alphanumeric characters as well as !#$%&'*+~/=?{|}_-. Letters are case-sensitive. For security, password text strings are indicated as dots or other symbols.
Mutual CHAP authentication is also described in *SnapSAN Manager Command Reference* as **Bidirectional CHAP authentication**.

For description of CHAP authentication, refer to *Appendix O: "CHAP Authentication"*
The Target Secret that is set here is a password that a target uses to authenticate an Initiator. This password is also required for settings on the disk array side (see *Section: 13.2.21 iSMcfg setldsetchap in the SnapSAN Manager Command Reference*), so be sure to write it down so it is not forgotten.

---

4. Click the **OK** button.

   Perform the following steps:
5. Select iqn of target.
6. Delete the selected iqn.

7. Check that the iqn status of the target disk array controller is shown as **Connected** (transition from inactive).

- When adding registration of host port (iSCSI port) for the disk array (redundant configuration).

  Click the **Log On** button.

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- When not adding registration of host port (iSCSI port) for the disk array (non-redundant configuration)

8. Click the **OK** button. This completes the operations.

When adding host port registration

1. Change the following setting. When finished, click the **Advanced** button.

- Select the **Automatically restore this connection when the system boots** option.
- Select the **Enable multi-path** option.

NOTE: Under the settings for the newly registered disk array host port, select the Enable multi-path option.

When registering additional host port

1. Change the following settings. When finished, click the **OK** button.

Connection settings

- Select the Microsoft iSCSI Initiator option from the Local Adapter drop-down menu.
- Select the IP address of the local server from the Source IP drop-down menu.
- Select the IP address of the disk array host port (iSCSI port) from the Target Portal drop-down menu.

CHAP authentication settings

- Select the **CHAP logon information** option.
- Enter password to be assigned to target in the **Target Secret** box.
- Select **Execute mutual CHAP** option when using mutual CHAP authentication.

For description of CHAP authentication, refer to *Appendix O: "CHAP Authentication"*.

CAUTION: The CHAP Secret can be specified as any string of 12 to 16 alphanumeric characters as well as !#$%&'*+~/=?{|}_-. Letters are case-sensitive. For security, password text strings are indicated as dots or other symbols.

Mutual CHAP authentication is also described in SnapSAN Manager Embedded as **Bidirectional CHAP authentication**.

NOTE: For description of CHAP authentication, refer to *Appendix O: "CHAP Authentication"*

CAUTION: The Target Secret that is set here is a password that a target uses to authenticate an Initiator. This password is also required for settings on the disk array side (see *Section: 13.2.21 iSMcfg setIdsetchap in the SnapSAN Manager Command Reference*), so be sure to write it down so it is not forgotten.

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Additional host port registration

1. Click the **OK** button.
2. Log On to Target Screen
3. To register additional disk array host ports, click the **Log On** button, and then perform steps (6) to (8) for each port to be registered.
4. After the host port settings have been registered, click the **OK** button.

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Appendix D

Linux FC/SAS Application Server

This appendix provides the steps you should follow while setting or checking application server in the Linux environment, when the disk array is configured for the FC connection.

Installing SnapSAN Manager Agent Utility

This section describes how to install the SnapSAN Manager Agent Utility.

Before Installation

Note the followings before installing the SnapSAN Manager Agent Utility. The following functions become available by installing the SnapSAN Manager Agent Utility.

- iSM volume list command
- Host agent (Host agent service)
- iSCSI Setup Tool
- Storage Host Register Agent

Table D-1: Operating Environment (Linux)

Item	Supported Environment
Operating systems	Red Hat Enterprise Linux Version 5 (*1) • Red Hat Enterprise Linux 5.5 to 5.7 (IA32/EM64T) • Red Hat Enterprise Linux 5.5 to 5.7 Advanced Platform (IA32/EM64T) Red Hat Enterprise Linux Version 6 • Red Hat Enterprise Linux 6.1 (IA32/EMT64) SUSE Linux Enterprise Server10 • SUSE Linux Enterprise 10 SP3 (IA32/EM64T) (*2) (*1) The iSCSI Setup Tool (sharing function) supports Red Had Enterprise Linux 5.5 (IA32, EM64T). (*2) Only for disk arrays conted via FC
Memory	OS required memory + 5 MB or more (IA32 server and EM64T server)
Disk capacity	12 MB or more

* Above are the supported environments for this version at the point of the initial shipment of this product.

Installation

Install the SnapSAN Manager Agent Utility by following the procedure below:

1. Log in as a root user.

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2. Check that none of the following software has been installed:

- iSMrpl (ReplicationControl)
- iSMrcd (ReplicationControl/DisasterRecovery)
- iSMsc (SnapControl)
- iSMvol (iSM volume list command)
- iSMagent (SnapSAN Manager Agent Utility)

Run the following commands and check the results:

```
rpm -q iSMrpl
rpm -q iSMrcd
rpm -q iSMsc
rpm -q iSMvol
rpm -q iSMagent
```

If any of them has been installed, uninstall all of them.

1. Set the CD-ROM in the application server.

NOTE: On the server where CD-ROMs are not available, transfer the file of iSMvol.rpm from other server to install it.

2. Mount the CD-ROM by performing one of the following:

- Create a mount directory (Example: `/cdrom`)
- Use the mount command for mounting.

```
mount -r /dev/cdrom /cdrom
```

3. Use the `rpm` command to start installation.

```
rpm -ivh /cdrom/VOLLIST/LINUX/iSMVOL/iSMvol.rpm
```

When the installation is complete, the ***Installation completed*** message appears.

4. Unmount the CD-ROM. Use the umount command for unmounting.

```
umount/cdrom
```

Collecting/Registering Host Information on Application Server

Collecting Host Information by Using File Output

To collect host information by using file output, follow the procedure below.

1. Run host information collection command (`iSMcc_hostinfo`)
2. Run the host information collection command (`iSMcc_hostinfo`) from the command line. For the `-export` option, specify a file (host information file) to which host information will be reported.

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3. Run the host information collection command (`iSMcc_hostinfo`) as a root user.

```
# iSMcc_hostinfo -export /tmp/ServerName
iSMcc_hostinfo: Info:        iSM11700: Please wait a minute.
iSMcc_hostinfo: Info:        iSM11770: Host Information was exported
successfully. code=
aaaa-bbbb-bbbb-bbbb)
iSMcc_hostinfo: Info:        iSM11100: Command has completed
successfully.
```

4. Confirm the result of running the command
5. After running the host information collection command (`iSMcc_hostinfo`), confirm that the message No. `iSM11770` is reported and the host information is successfully collected. `aaaa` in the message example above is replaced with a process number and `bbbb` with an internal code for maintenance in the actual message.
6. Transfer the host information file
7. Transfer the host information file reported by using the host information collection command (`iSMcc_hostinfo`) to a client by using file transfer, USB memory and other methods.

To register host information files transferred to clients, see *Section : "Registering Host Information by Using File Output".*

Registering Host Information by Using File Output

To register host information by using file output, follow the procedure below.

1. Report a host information file.

   See *Section : "Collecting Host Information by Using File Output"* to report a host information file.

2. Transfer the host information file.
3. Use file transfer, USB memory or other methods to transfer the host information file to a client.
4. Register the host information by using SnapSAN Manager.
5. On the left pane on the SnapSAN Manager window, click **Configuration> Host > Host Information Collection** to open the host information registration window.
6. Select host information setting method.
7. Select the **Update with host information file** and click **Next**.
8. Specify the host information file.
   a. Click **Browse** to specify a file in which host information is recorded and click **Add**.
   b. Confirm that all the host information is retrieved and click **Next**.

   This displays the Host information setting completion page.
9. Check the **Host information Collection Completion** page.
10. The result of setting host information is displayed. Click **Finish** to close the page.

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Checking connection from Application Server

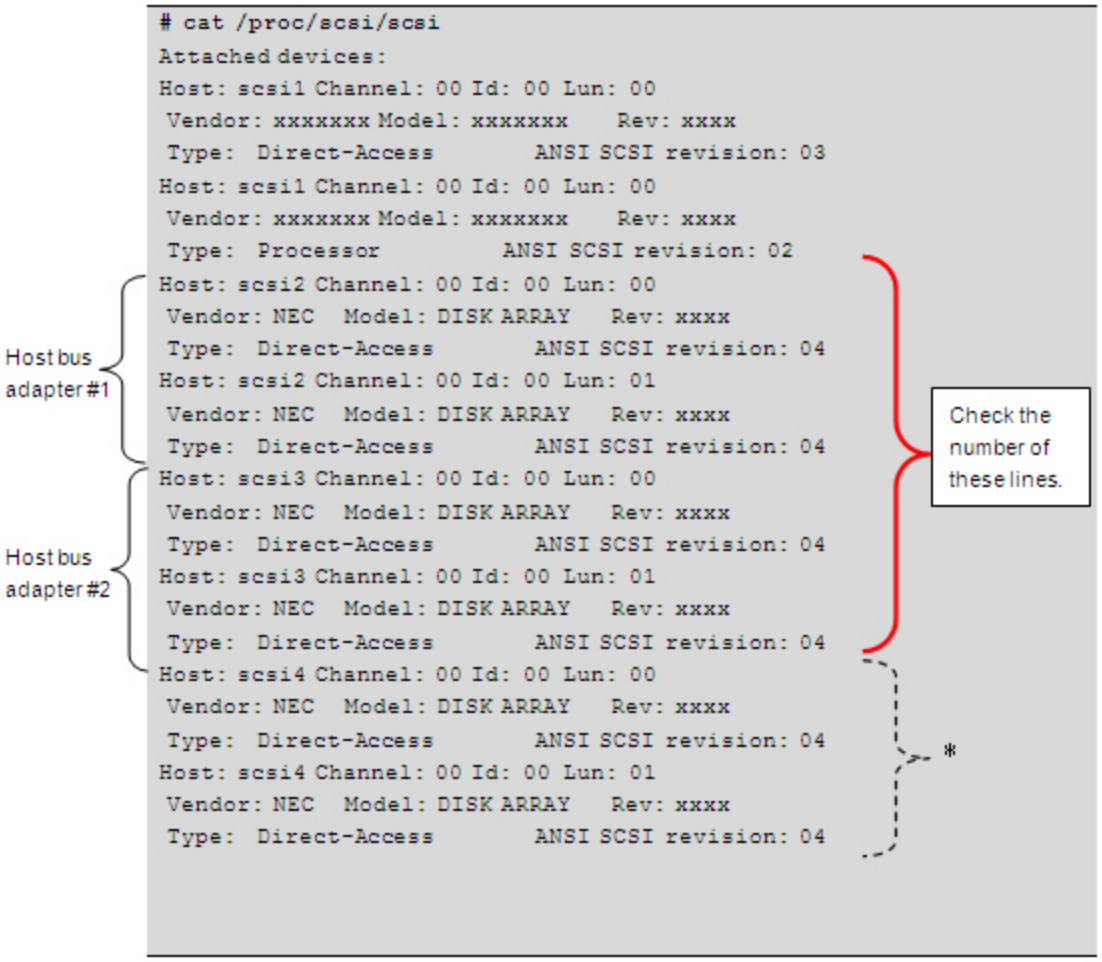
This section describes how to check connection in Linux environment and check the Path Manager settings and status.

Confirmation Steps in Linux environment

After checking the FC cable connection between the application server and disk array controller, restart the application server and run the following command to check the number of logical disks ("No. of logical disks assigned to application server" × “No. of access paths from application server to individual logical disks”) and the respective vendor and model names (, DISK ARRAY).

NOTE: If nothing is shown, the OS was unable to recognize logical disks in the disk array assigned to an application server. Check the connection between the server and disk array controller, the Access Control host bus adapter driver settings, etc.

Display example: When two logical disks are assigned to a server, with two access paths per logical disk.




```
# cat /proc/scsi/scsi
Attached devices:
Host: scsi1 Channel: 00 Id: 00 Lun: 00
 Vendor: xxxxxxx Model: xxxxxxx    Rev: xxxx
 Type:  Direct-Access        ANSI SCSI revision: 03
Host: scsi1 Channel: 00 Id: 00 Lun: 00
 Vendor: xxxxxxx Model: xxxxxxx    Rev: xxxx
 Type:  Processor          ANSI SCSI revision: 02
Host: scsi2 Channel: 00 Id: 00 Lun: 00
 Vendor: NEC   Model: DISK ARRAY   Rev: xxxx
 Type:  Direct-Access        ANSI SCSI revision: 04
Host: scsi2 Channel: 00 Id: 00 Lun: 01
 Vendor: NEC   Model: DISK ARRAY   Rev: xxxx
 Type:  Direct-Access        ANSI SCSI revision: 04
Host: scsi3 Channel: 00 Id: 00 Lun: 00
 Vendor: NEC   Model: DISK ARRAY   Rev: xxxx
 Type:  Direct-Access        ANSI SCSI revision: 04
Host: scsi3 Channel: 00 Id: 00 Lun: 01
 Vendor: NEC   Model: DISK ARRAY   Rev: xxxx
 Type:  Direct-Access        ANSI SCSI revision: 04
Host: scsi4 Channel: 00 Id: 00 Lun: 00
 Vendor: NEC   Model: DISK ARRAY   Rev: xxxx
 Type:  Direct-Access        ANSI SCSI revision: 04
Host: scsi4 Channel: 00 Id: 00 Lun: 01
 Vendor: NEC   Model: DISK ARRAY   Rev: xxxx
 Type:  Direct-Access        ANSI SCSI revision: 04
```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NOTE: In the environment where Path Manager is installed, in some cases, depending on the Linux kernel version, the logical disks that can be controlled by Path Manager are displayed after the logical disks recognized by the OS via the host bus adapter (comprised in the above example of host bus adapter #1 and host bus adapter #2).

Check the Path Manager Settings and Status

When Path Manager will not be used, this step is not essary.

After checking the FC cable connection between the application server and disk array controller, restart the server and run the following command from the command prompt. For details, refer to the *Path Manager User's Guide (Linux version)*.

Check the kernel version

1. Check that the installed Path Manager supports the currently used kernel.
2. Check that kernel version (A) number shown under `uname -r` matches the value shown for kernel version (B) under `rpm -qi`.

```
# uname -r
2.6.X-XX
# rpm -qa | grep sps
sps-drivers-E-5.x.x
sps-utils-5.x.x-x.x
# rpm -qi sps-drivers-E-5.x.x
Name   : sps-driver-E            Relocations: (not relocatable)
Version : 5.x.x                    Vendor:   Corporation
Release : 2.6.x.x.x              Build Date: xxxx(year) xx (month) xx
(day) xx (hour) xx (min) xx (sec)
Install Date: xxxx(year)xx(month)xx(day) xx(hour)xx(min)xx(sec) Build
Host: .co.jp
Group     : System Environment/Kernel    Source RPM: sps-driver-E-5.x.x-
2.6.x.x.x.src.rpm
Size      : xxxx                    License: GPL
Signature   : (none)
Packager   :   Corporation
Summary    : Path Manager for Linux
Description :
---------------------------------------------------------------------
The driver (dd_mod,sps_mod,sps_mod2) provides the redundant SCSI-path
for
 iStorage Disk Array System.

This Driver works on Red Hat Enterprise Linux 5 (2.6.x-x.x)
```

NOTE: Display may vary slightly among different operating systems

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Check the Path Manager status

3. Check `/proc/scsi/sps/ddX`, where X is a, b, c, ... (number of logical disks assigned to server).

The `path-info:` line exists only for multiplexed sections of each device, and if NML appears in all of the status columns of device-info:, paths are normally multiplexed.

NOTE: If nothing is shown, none of the access paths recognized the logical disks of the disk array controller assigned to the application server. Check the connection between the application server and the disk array controller, the Access Control settings, host bus adapter driver settings, etc.

Display example: When two logical disks are assigned to a server, with two access paths per logical disk.

```
# cat /proc/scsi/sps/dda
device:/dev/dda
disk-info:,DISK ARRAY,xxxxxxxxxxxxxxx,xxxxx
device-info:Host:scsi:2 Channel:0 Id:0 Lun:0 Watch:Enable Status:NML
LoadBalance:D2
path-info:0 Host:scsi:0 Channel:0 Id:0 Lun:0 Priority:1 Status:ACT
path-info:1 Host:scsi:1 Channel:0 Id:0 Lun:0 Priority:2 Status:HOT
#
```

Check the path patrol daemon

4. Confirm that the path patrol daemon is running.
5. When the path patrol daemon is started, the following message is displayed.

```
# /etc/rc.d/init.d/dd_daemon status
dd_daemon (pid XXX) is running ...
#
```


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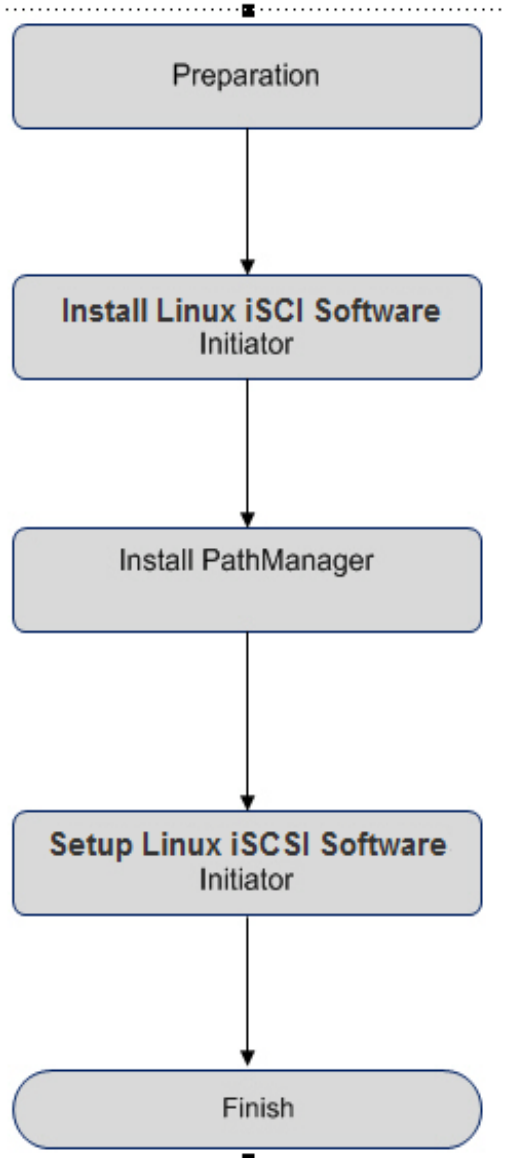
Linux iSCSI Application Server

Perform the following steps to initialize the application server in Linux environments.

Table E-1:

Process Flow	Description
	Prepare for installation. For details, refer to *Section : Preparation*. Install the iSCSI-initiator-utils package. For details, refer to *Section E.1.2: Installing iSCSI Software Initiator*. If the iSCSI-initiator-utils package has already been installed, this step is not necessary. Install Path Manager. For details, refer to *Section C.1.3: Installing Path Manager*. When Path Manager will not be used, this step is not necessary. This describes how to set up the Open-iSCSI driver and CHAP authentication. For details, refer to *Section E.1.4: Setting up iSCSI Software Initiator*.

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Preparation

Perform the following steps to prepare for installation of application server in Linux environment:

1. Provide IP addresses for an application server

   Prepare IP addresses to be assigned to the application server as many as the NIC (1000BASE-T or 10GBASE-SR) ports. In addition, prepare the subnet mask and gateway addresses by asking the network administrator.

CAUTION: If two or more IP addresses are used by Path Manager, the same network segment cannot be specified. Prepare IP addresses of other segments.

Example 1: Connectable configuration
HP0:192.168.0.10
HP1:192.168.1.10
Example 2: Unconnectable configuration
HP0:192.168.0.10
HP1:192.168.0.11

2. Install the NIC (1000BASE-T or 10GBASE-SR) driver

   Install and set up the driver according to the setup procedure in the manual provided with the NIC installed in the server, or by referencing information provided on the Web, etc.

   NOTE: If the NIC has already been attached to the application server, this step is not necessary.

3. Install NIC (1000BASE-T or 10GBASE-SR)

   Install the NIC to the application server as described in the manuals provided with the NIC and application server

   NOTE: If NIC has already been installed to the application server, this step is not necessary.

4. Install the NIC (1000BASE-T or 10GBASE-SR) driver
5. Install and set up the driver according to the setup procedure in the manual provided with the NIC installed in the server, or by referencing information provided on the Web, etc.

   NOTE: If the driver has already been installed and set up for the NIC installed in the application server, this step is not necessary.

6. Specify the network settings

   Select **Start** > **Control Panel** > **Network Connection**, and then open **Local Area Connection Properties** to specify the IP address, subnet mask, and default gateway.

7. Connect to the disk array controller

   Use a 10-Gbps or 1-Gbps cable to connect the application server to the host port (HP connector) of the disk array controller.

- Unit equipped with 10Gbps iSCSI 2port controllers

  10-Gbps cable

  Connector shape: LC connector

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NOTE: FC cable can be used.

- Unit equipped with 1Gbps iSCSI 2port controllers

  1-Gbps cable

  Connector shape: RJ-45 connector

NOTE: CAT6 LAN cable is recommended.

Either straight cable or crossover cable can be used.

For a sample connection configuration, see *Appendix L: "iSCSI Connection Configuration-Examples"*.

The following shows the positions of the host ports.

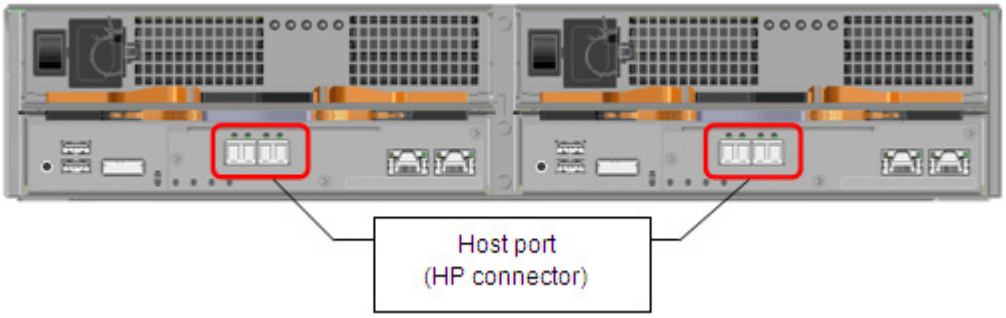

Figure E-1: Unit 10Gbps iSCSI 2port Controllers

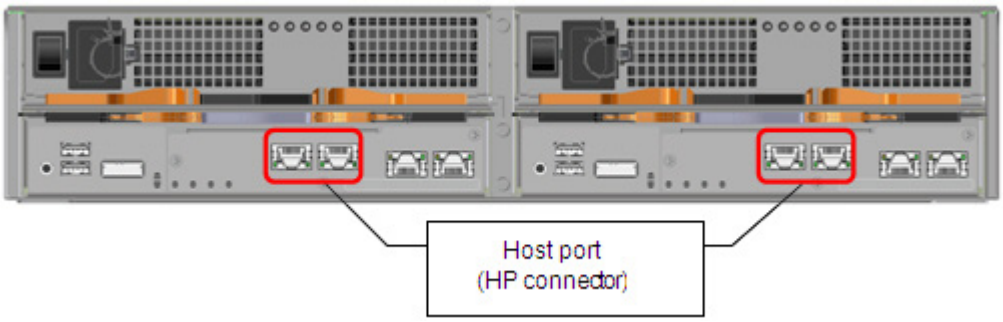

Figure E-2: Unit with1Gbps iSCSI 2port Controllers

The following shows an example of a 10-Gbps iSCSI connection (redundant path configuration in combination with Path Manager).

To implement the following recommended example, two NICs must be installed in the application server and two 10-Gbps cables are needed to connect the disk array controller and NICs.

Use a 10-Gbps cable to connect the NIC to the host port (HP connector) of the disk array controller. (The 10-Gbps cable has the same connector shape on both ends.)

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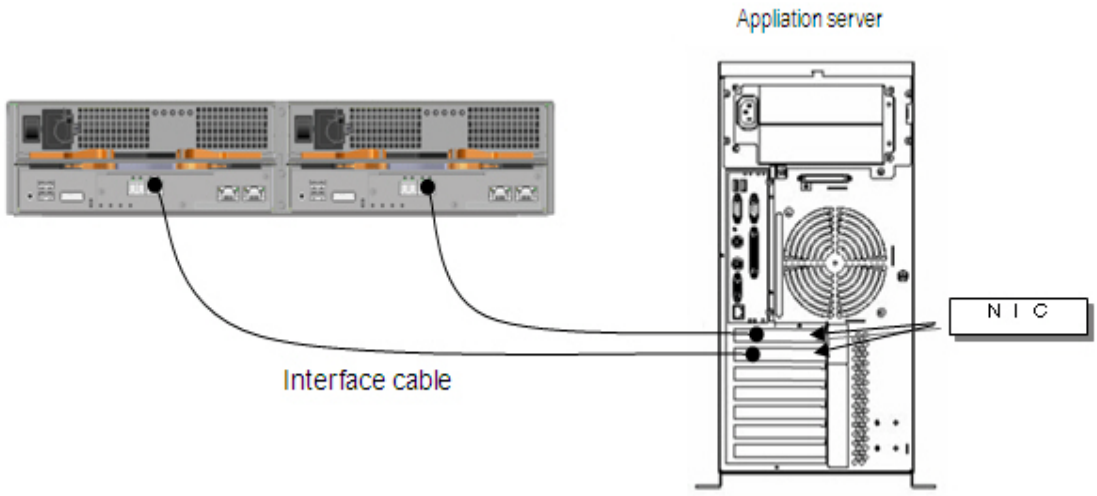

Figure E-3: Configuration Example

Installing iSCSI Software Initiator

Installation of iscsi-initiator-utils package is necessary.

Install the package by following the procedures on the manual of the operating system or the information provided on the website.

NOTE: This procedure is unnecessary if the installation of iscsi-initiator-utils package is already finished.Open-iscsi is installed as standard DBM database. Discovery (discovery.db) and Node (node.d) tables are included. The iSCSI database files are stored in /etc/iscsi/.

Install iscsi-initiator-utils package.

```
# yum install iscsi-initiator-utils
```

Installing Path Manager

See *Section : For Linux Application Server* for installation procedure.

This operation is not necessary if you do not install Path Manager.

Setting up iSCSI Software Initiator

Perform the following steps to install iSCSI Software Initiator in the Linux environment:

Set up Open-iSCSI Driver

1. Run the following command from the console to stop the iSCSI service.

```
# service iscsid stop
```


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NOTE: If the iSCSI service has already been stopped, this step is not necessary.

2. Use `vi` or another editor to open the `/etc/iscsi/iscsid.conf` file on the server.
3. After changing the settings in the variables shown in *Table E-2: Open-iSCSI Driver Settings* to the following values, save and close the file.

Table E-2: Driver Settings

Variable Name	Default value	Set value	Remarks
node.startup	No	Automatic	Automatically log on after the server reboots
node.session.timeo.replacement_timeout	120	30	Shorten the failover time when using Path Manager

```
node.startup = Automatic
node.session.timeo.replacement_timeout = 30
```

4. Run the following command from the console to start the iSCSI service.

```
# service iscsi start
```

5. Run the following command from the console to confirm that the iSCSI service is operating.

```
# /etc/init.d/iscsi status
```

Set up CHAP Authentication

NOTE: If CHAP authentication will not be used, this step is not necessary. For description of CHAP authentication, refer to *Appendix O: "CHAP Authentication"*

- Setup method when using **CHAP authentication of Initiator**.

1. Use `vi` or another editor to open the `/etc/iscsi/iscsid.conf` file on the server.
2. After editing the file as shown below, save and close the file.

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```
  node.session.auth.authmethod = CHAP
  node.session.auth.username = <iqn (username) of
  server>
  node.session.auth.password = <password of CHAP
  Initiator>

  (Example)
  node.session.auth.authmethod = CHAP
  node.session.auth.username = iqn.1991-
  05.com.microsoft.exp120rj
node.session.auth.password = jR021_0085sserpxE
```

3. Restart the iSCSI service

```
  # /etc/init.d/iscsi stop
  # /etc/init.d/iscsi start
```

CAUTION: The CHAP Initiator password that is set here is a password that a target uses to authenticate the Initiator. This password is also required for settings on the disk array side (see *Section: 13.2.21 iSMcfg setIdsetchap in the SnapSAN Manager Command Reference*), so be sure to write it down so it is not forgotten.

- Setup method when using **bidirectional CHAP authentication**.

1. Use `vi` or another editor to open the `/etc/iscsi/iscsid.conf` file on the server.

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2. Edit the file as shown below, then save and close the file.

```
node.session.auth.authmethod = CHAP
node.session.auth.username = <iqn (username) of
server>
node.session.auth.password = <password of CHAP
Initiator>
node.session.auth.username_in= <iqn (username) of
disk array>
node.session.auth.password_in = < password of CHAP
target>

(Example)
node.session.auth.authmethod = CHAP
node.session.auth.username = iqn.1991-
05.com.microsoft.exp120rj
node.session.auth.password = jR021_0085sserpxE
node.session.auth.username_in = iqn.2001-
03.jp.nec:storage01:ist-m000-sn-
0000000938209213.wn-0.target0000 -p
192.168.10.64:3260
node.session.auth.password_in = i3DegarotsiCEN
```

3. Restart the iSCSI service.

```
# /etc/init.d/iscsi stop
# /etc/init.d/iscsi start
```

CAUTION: The CHAP Initiator password that is set here is a password that a target uses to authenticate the Initiator. This password is also required for settings on the disk array side (see *Section: 13.2.21 iSMcfg setIdsetchap in the SnapSAN Manager Command Reference*), so be sure to write it down so it is not forgotten.

Execute Discovery

- Method when not using iSNS (Internet Storage Name Service) server

4. Use the `iscsiadm` command to search for the target.

```
# iscsiadm -m discovery -t sendtargets -p <IP
address of disk array>
(Example)# iscsiadm -m discovery -t sendtargets -
p 192.168.1.1:3260
```

- Method when using iSNS server

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5. Use `vi` or another editor to open the `/etc/iscsi/iscsid.conf` file on the server.
6. Set the IP address and port number of the corresponding iSNS server.
7. Restart iSCSI service.

```
# /etc/init.d/iscsi stop
# /etc/init.d/iscsi start
```

8. Get Initiator information from an application server registered to iSNS server.

See *Appendix N: "Retrieve Initiator Information on Application Servers Registered with iSNS Server"*.

NOTE: When using iSNS server, the Initiator name of the application server must be directly entered under the Initiator settings in the iSCSI Setup Tool.

iSCSI Setup Tool

Run the iSCSI Setup Tool on an application server to configure the iSCSI settings required for the application server. Before starting the following section, you need to install the SnapSAN Manager Agent Utility. SeeSnapSAN Manager Agent Utility Section for details on how to install the SnapSAN Manager Agent Utility.

1. Run the following script on the application server.

```
# iSMiSCSISetup.sh
```

2. When a list of serial numbers is shown as follows, enter a list number corresponding to the serial number of the disk array controller you want to configure.

```
1) 0000000991000001
2) 0000000991000002
3) 0000000991000003
4) 0000000991000004
Please select serial number.
```

3. The following message appears to confirm whether to use CHAP authentication. Enter `y` to use the CHAP authentication. Enter `n` to skip the CHAP authentication.

```
To use CHAP authentication, please enter 'y'. [y/n]
```

4. When `n` is entered to skip the CHAP authentication, proceed to step (9). When `y` is entered to use the CHAP authentication, the following message appears. Enter the password of the CHAP initiator.

```
Please enter the target CHAP secret.
```


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5. To confirm, enter the password of the CHAP initiator again.

```
Please enter password again.
```

6. This is to confirm whether to use mutual CHAP authentication. Enter `y` to use the mutual CHAP authentication. Enter `n` to skip the mutual CHAP authentication.

```
To use mutual CHAP authentication, please enter 'y'. [y/n]
```

7. Proceed to step (9) when `n` is entered to skip the CHAP authentication. If `y` is entered to use the mutual CHAP authentication, the following message appears. Enter the password of the CHAP target.

```
Please enter the initiator secret.
```

8. To confirm, enter the password of the CHAP target again.

```
Please enter password again.
```

9. The IP addresses of the disk array are listed as follows. Enter a list number corresponding to the IP addresses of the disk array. iSCSI Setup Tool runs a ping command using the IP addresses that are set in the host connection port parameters. It does not show failed results and delete the failed ones from the search result of the target.

```
1) Serial number=0000000991000004, Controller=0, IP
address=172.168.1.101
2) Serial number=0000000991000004, Controller=0, IP
address=172.168.1.102
3) Serial number=0000000991000004, Controller=1, IP
address=172.168.2.101
4) Serial number=0000000991000004, Controller=1, IP
address=172.168.2.102
Please select target IP address.
```

10. After the following message appears to confirm whether to create an LD set, enter `y` to proceed.

```
To create LD set, please enter 'y'. [y/n]
```

11. When the process is successfully complete, a list of the IP addresses appears as follows:

```
Succeed to log on to the target.
Serial number=XXXXXXXXXXXXXXXX, Controller=X, IP
address=XXX.XXX.X.XXX
```


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The above is an example. You will actually see the serial number, controller number and IP address of the target. You can specify a parameter file as shown below.

```
# iSMiSCSISetup.sh [-f <parameter name> [-n]]
```

- When you specify `-f <parameter name>`, a parameter is loaded from the file specified.
- When you specify `-n`, a dry run is performed to check for any parameter error, and does not process

The details of the parameter file are described as follows.

Details

```
-m <Serial number>

-I <Password of CHAP initiator>

-t <Password of CHAP target>

-p <IP address of host connection port>
```

Descriptions

- In case CHAP authentication is not used, you do not need to supply a password of the CHAP initiator and a password of the CHAP target. When you use CHAP authentication, use the initiator name for the user name of CHAP initiator.
- In case mutual CHAP authentication is not used, you do not need to supply a password of CHAP target. When you use mutual CHAP authentication, use the target name for the user name of CHAP target.
- Lines, where any other letters than ones mentioned above is specified followed by a hyphen (-), are ignored and the operation continues.

For example: When CHAP authentication is not used.

```
-m 0000000991000004

-p 172.168.1.101
```

For example: When Mutual CHAP authentication is used.

```
-m 0000000991000004

-i jR0210085sserpxE

-t i3DegrarotsiCEN

-p 172.168.1.101
```

CAUTION: See below

It is necessary to configure a public key with SnapSAN Manager for SSH connection.

How to register:

1. When you run the following command, it prompts for your parameter entry Do not enter anything but press the Enter key

   ssh-keygen -t rsa

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2. After you run the following command, it prompts for a user name and password entries. Enter sysadmin for the user name and the password of the sysadmin user.

ftp <IP addresses of management ports for SnapSAN Manager>
After you subsequently run the following commands, run the quit command to end the FTP.
cd .ssh
get authorized_keys

3. Run the following command.

cat ./.ssh/id_rsa.pub >> authorized_keys

4. When you run the following command, it prompts for a user name and password entries. Enter sysadminj for the user name and the password of the sysadmin user.

ftp < IP addresses of management ports for SnapSAN Manager>>

5. After you subsequently run the following commands, run the quit command to end the FTP.

cd .sshput authorized_keys

6. Run the following command.

```
ssh sysadmin@< IP addresses of management ports for SnapSAN
Manager>>
```

7. When the following message appears, enter `yes`.

```
Are you sure you want to continue connecting (yes/no)?
```

8. Check it does not prompt for a password entry, and then run the exit command to end SSH.

- Because the port number 2730 is used, you need to set the exception for the firewall.
- iSCSI Initiator needs to be installed and the service must be started in advance.

If you use the CHAP authentication with two or more disk arrays, please follow the procedures shown as below.

Procedures

1. Configure the iSCSI setting using iSCSI Setup Tool.
2. Execute the following command in the order as below. (If there are two or more IP addresses succeeded to log on, execute the iscsiadm command repeatedly to each IP address.)

```
service iscsi stop
iscsiadm -m node -o delete -p <target IP addresss succeeded to log
on in step 1.>
service iscsi start
```

3. Select the IP address of another disk array by iSCSI Setup Tool, and configure the iSCSI setting.
4. Execute the following command. (If there are two ore more IP addresses succeeded to log on, use the first IP address specified in step 2.)

```
iscsiadm -m discovery -t sendtargets -p <target IP addresss
succeeded to log on in step 1.>
```


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5. Execute the following commands.

```
iscsiadm -m node --targetname <target name specified in step /1/> -
p <target IP addresss succeeded to log on in step /1/> --op update
-n node.session.auth.authmethod -v CHAP
iscsiadm -m node --targetname <target name specified in step /1/> -
p <target IP addresss succeeded to log on in step /1/> --op update
-n node.session.auth.username -v <initiator name>
iscsiadm -m node --targetname <target name specified in step /1/> -
p <target IP addresss succeeded to log on in step /1/> --op update
-n node.session.auth.password -v <CHAP password for the initiator>
```

6. f you use mutual CHAP authentication, execute the following commands.

```
iscsiadm -m node --targetname <target name specified in step 1.> -p
<target IP address succeeded to log on in step 1.> --op update -n
node.session.auth.username_in -v <target name specified in step 1.>
iscsiadm -m node --targetname <target name specified in step 1.> -p
<target IP address succeeded to log on in step 1.> --op update -n
node.session.auth.password_in -v <CHAP password for the target>
```

7. Execute the following command.

(If there are two or more IP addresses succeeded to log on, repeat the steps 5-7)

```
iscsiadm -m node --targetname <target name specified in step 1.> -p
<target IP address succeeded to log on in the step 1.> -l
```

* If you use three or more disk arrays, repeat the procedures in steps 1-2 repeatedly, and then perform the procedure in step 3 for the last disk array controller. And then perform the procedure the steps 4–7 repeatedly for each disk arrays you have done the procedures in step 1-2.)

Checking Connection from Application Server

Perform the following steps to connect the application server and disk array in Linux environments.

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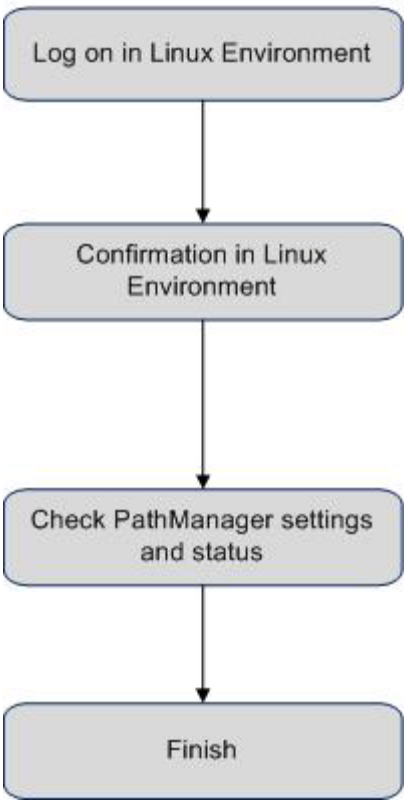
Table E-3: Process Flow

Process Flow	Description
	Log on to the target. Confirm the that OS recognizes the logical disk. Check Path Manager settings and status. If Path Manager will not be used, this step is not necessary.

Logon Steps in Linux Environments

1. Search for target.

```
# iscsiadm –m discovery –t sendtargets –p <IP
address of disk array>
(Example)# iscsiadm -m discovery -t sendtargets -p
192.168.10.64:3260
```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2. Log on to target.

```
# iscsiadm –m node -T <iqn of disk array> -p <IP
address of disk array> -l
(Example)# iscsiadm –m node –T
iqn.2001-03.jp.nec:storage01:ist-m000-
sn0000000938209213.
wn-0.target0000 -p 192.168.10.64:3260 -l
```

Confirmation steps in Linux Environment

Run the following command to check the number of logical disks (No. of logical disks assigned to application server × No. of access paths from application server to individual logical disks) and the respective vendor and model names (DISK ARRAY).

```
# cat /proc/scsi/scsi
```

CAUTION: If nothing is shown, none of the access paths recognized the logical disks of the disk array controller assigned to the application server. Check the connection between the application server and the disk array controller, the Access Control settings, NIC driver settings and so on.

Display example: When two logical disks are assigned to a server, with two access paths per logical disk.

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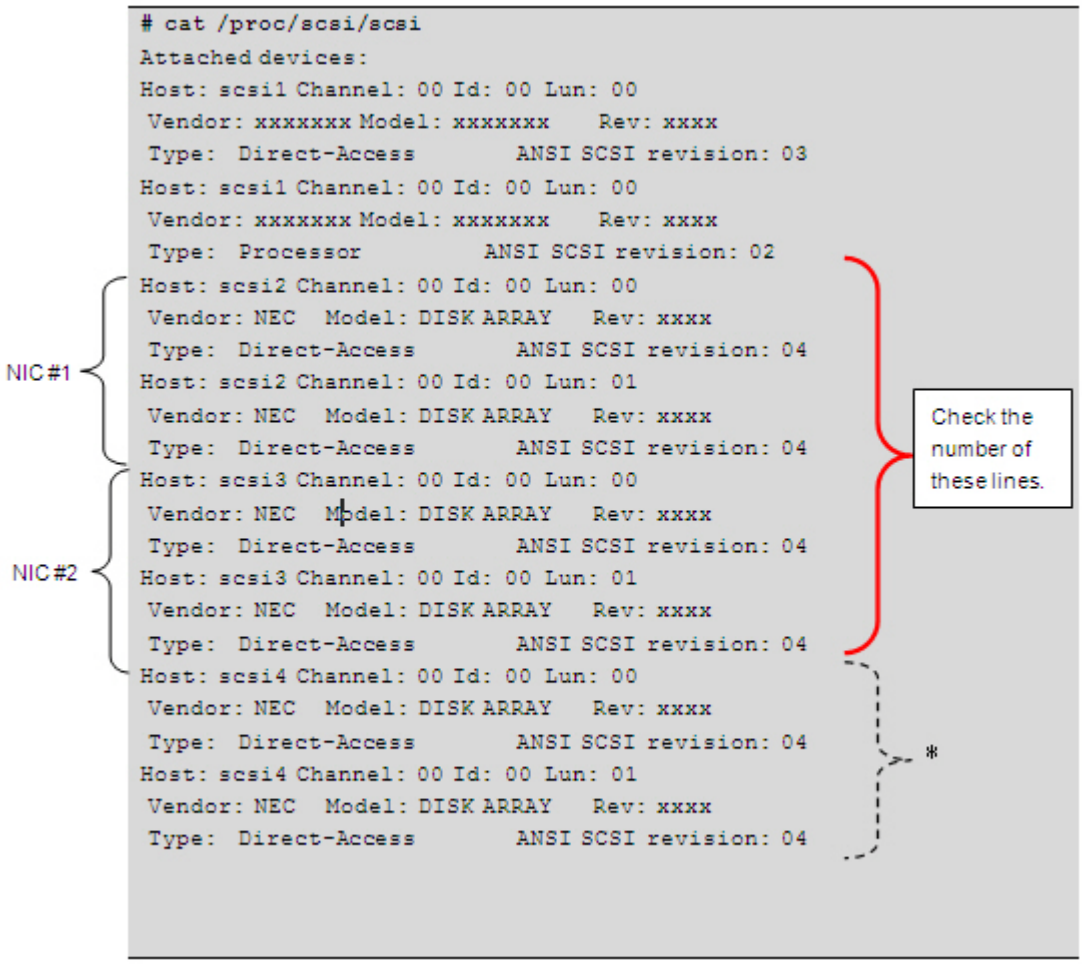
cat /proc/scsi/scsi
Attached devices:
Host: scsi1 Channel: 00 Id: 00 Lun: 00
Vendor: xxxxxxx Model: xxxxxxx Rev: xxxx
Type: Direct-Access ANSI SCSI revision: 03
Host: scsi1 Channel: 00 Id: 00 Lun: 00
Vendor: xxxxxxx Model: xxxxxxx Rev: xxxx
Type: Processor ANSI SCSI revision: 02
Host: scsi2 Channel: 00 Id: 00 Lun: 00
Vendor: NEC Model: DISK ARRAY Rev: xxxx
Type: Direct-Access ANSI SCSI revision: 04
Host: scsi2 Channel: 00 Id: 00 Lun: 01
Vendor: NEC Model: DISK ARRAY Rev: xxxx
Type: Direct-Access ANSI SCSI revision: 04
Host: scsi3 Channel: 00 Id: 00 Lun: 00
Vendor: NEC Model: DISK ARRAY Rev: xxxx
Type: Direct-Access ANSI SCSI revision: 04
Host: scsi3 Channel: 00 Id: 00 Lun: 01
Vendor: NEC Model: DISK ARRAY Rev: xxxx
Type: Direct-Access ANSI SCSI revision: 04
Host: scsi4 Channel: 00 Id: 00 Lun: 00
Vendor: NEC Model: DISK ARRAY Rev: xxxx
Type: Direct-Access ANSI SCSI revision: 04
Host: scsi4 Channel: 00 Id: 00 Lun: 01
Vendor: NEC Model: DISK ARRAY Rev: xxxx
Type: Direct-Access ANSI SCSI revision: 04
NIC #1
NIC #2
Check the number of these lines.
*

***** In the environment where Path Manager is installed, in some cases, depending on the Linux kernel version, the logical disks that can be controlled by Path Manager are displayed after the logical disks recognized by the OS via the NIC (comprised in the above example of NIC#1 and NIC#2).

Check the Path Manager Settings and Status

NOTE: When Path Manager will not be used, this step is not necessary.

1. Check the kernel version

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Check that the installed Path Manager supports the currently used kernel. Check that kernel version (A) number shown under uname -r matches the value shown for kernel version (B) under rpm -qi.

```
# uname -r
2.6.X-XX
# rpm -qa | grep sps
sps-drivers-E-5.x.x
sps-utils-5.x.x-x.x
# rpm -qi sps-drivers-E-5.x.x
Name    : sps-driver-E          Relocations: (not
relocatable)
Version  : 5.x.x             Vendor: Overland Storage
Release : 2.6.x.x.x           Build Date: xxxx(year)
xx (month) xx (day) xx (hour) xx (min) xx (sec)
Install Date: xxxx(year) xx (month) xx (day) xx
(hour) xx (min) xx (sec) Build Host: nec.co.jp
Group    : System Environment/Kernel   Source RPM:
sps-driver-E-5.x.x-2.6.x.x.x.src.rpm
Size    : xxxx               License: GPL
Signature  : (none)
Packager  : Overland Storage
Summary   : Path Manager for Linux
Description :
-----------------------------------------------------
----------------The driver (dd_mod,sps_mod,sps_mod2)
provides the redundant SCSI-path for
iStorage Disk Array System.

This Driver works on Red Hat Enterprise Linux 5
(2.6.x-x.x)
```

2. Check the Path Manager status

   Check /proc/scsi/sps/ddX, where X is a, b, c, ... (number of logical disks assigned to server).

The path-info: line exists only for multiplexed sections of each device, and if NML appears in all of the status columns of device-info:, paths are normally multiplexed.

CAUTION: If nothing is shown, none of the access paths recognized the logical disks of the disk array controller assigned to the application server. Check the connection between the application server and the disk array controller, the Access Control settings, NIC driver settings and so on.

Display example: When two logical disks are assigned to a server, with two access paths per logical disk.

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```
# cat /proc/scsi/sps/dda
device:/dev/dda
disk-info: DISK ARRAY,xxxxxxxxxxxxxxx,xxxxx
device-info:Host:scsi:2 Channel:0 Id:0 Lun:0
Watch:Enable Status:NML
LoadBalance:D2
path-info:0 Host:scsi:0 Channel:0 Id:0 Lun:0
Priority:1 Status:ACT
path-info:1 Host:scsi:1 Channel:0 Id:0 Lun:0
Priority:2 Status:HOT
#
```

3. Check the path patrol daemon

Confirm that the path patrol daemon is operating. When the path patrol daemon is started, the following message is displayed.

```
# /etc/rc.d/init.d/dd_daemon status
dd_daemon (pid XXX) is running ...
#
```


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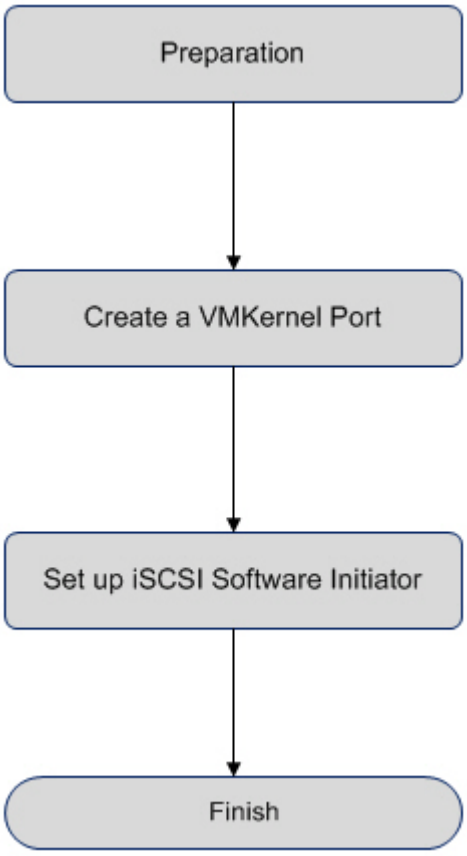
Appendix F

VMware iSCSI Application Server

This appendix provides the steps you should follow while setting or checking an application server in the VMware environment, when the disk array is configured for the iSCSI connection.

Initializing Application Server

Perform the following steps to initialize the application server in the VMware environment.



Prepare for installation.
For details, refer to *Section : Preparation*.

Create a VMKernel port and connect iSCSI to the network.
For ESX Server 3, connect the service console to the iSCSI network.
For details, refer to *Section : Creating VMKernel Port*.

Set the iSCSI Software Initiator as active, and then set the target address of the Initiator. If necessary, enter settings for CHAP authentication.
For details, refer to *Section : Setting up Software iSCSI Initiator*.

Preparation

Perform the following steps to prepare for installation of application server in VM environment:

1. Provide IP addresses for an application server

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Prepare IP addresses to be assigned to the application server as many as the NIC (1000BASE-T or 10GBASE-SR) ports. In addition, prepare the subnet mask and gateway addresses by asking the network administrator.

CAUTION: If two or more IP addresses are used by Path Manager, the same network segment cannot be specified. Prepare IP addresses of other segments.

Example 1: Connectable configuration
HP0:192.168.0.10
HP1:192.168.1.10
Example 2: Unconnectable configuration
HP0:192.168.0.10
HP1:192.168.0.11

2. Install the NIC (1000BASE-T or 10GBASE-SR) driver

Install and set up the driver according to the setup procedure in the manual provided with the NIC installed in the server, or by referencing information provided on the Web, etc.

NOTE: If the NIC has already been attached to the application server, this step is not necessary.

3. Install NIC (1000BASE-T or 10GBASE-SR)

Install the NIC to the application server as described in the manuals provided with the NIC and application server

NOTE: If NIC has already been installed to the application server, this step is not necessary.

4. Install the NIC (1000BASE-T or 10GBASE-SR) driver
5. Install and set up the driver according to the setup procedure in the manual provided with the NIC installed in the server, or by referencing information provided on the Web, etc.

NOTE: If the driver has already been installed and set up for the NIC installed in the application server, this step is not necessary.

6. Specify the network settings

Select **Start > Control Panel > Network Connection**, and then open **Local Area Connection Properties** to specify the IP address, subnet mask, and default gateway.

7. Connect to the disk array controller

Use a 10-Gbps or 1-Gbps cable to connect the application server to the host port (HP connector) of the disk array controller.

- Unit equipped with 10Gbps iSCSI 2port controllers

  10-Gbps cable

  Connector shape: LC connector

NOTE: FC cable can be used.

- Unit equipped with 1Gbps iSCSI 2port controllers

  1-Gbps cable

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Connector shape: RJ-45 connector

NOTE: CAT6 LAN cable is recommended.

Either straight cable or crossover cable can be used.

For a sample connection configuration, see *Appendix L: "iSCSI Connection Configuration-Examples"*.

The following shows the positions of the host ports.

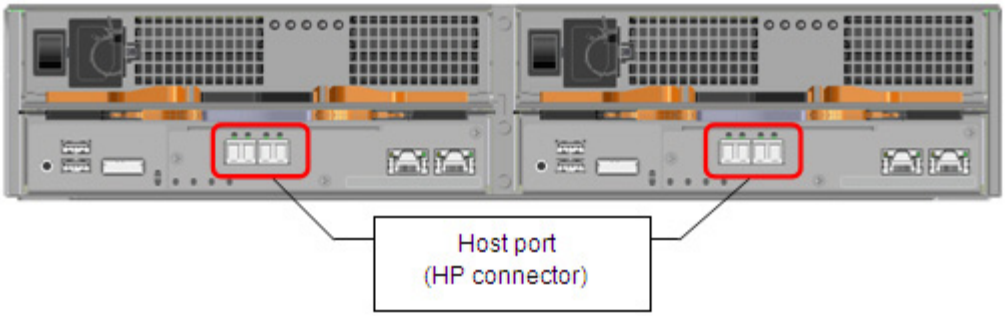

Figure F-1: Unit with 10Gbps iSCSI 2port Controllers

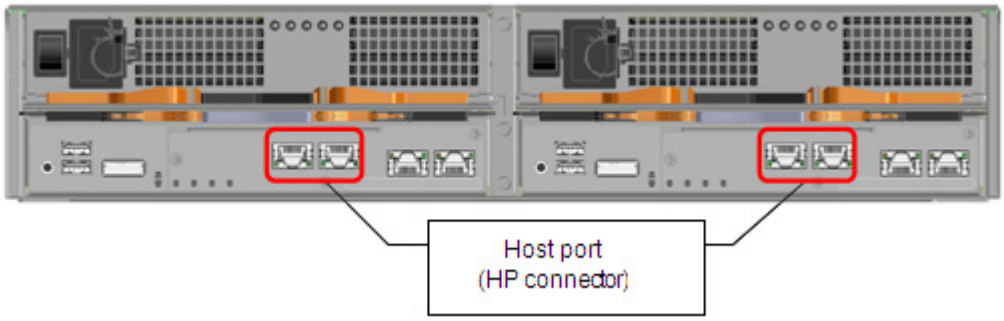

Figure F-2: Unit with 1Gbps iSCSI 2port Controllers

The following shows an example of a 10-Gbps iSCSI connection (redundant path configuration in combination with Path Manager).

To implement the following recommended example, two NICs must be installed in the application server and two 10-Gbps cables are needed to connect the disk array controller and NICs.

Use a 10-Gbps cable to connect the NIC to the host port (HP connector) of the disk array controller. (The 10-Gbps cable has the same connector shape on both ends.)

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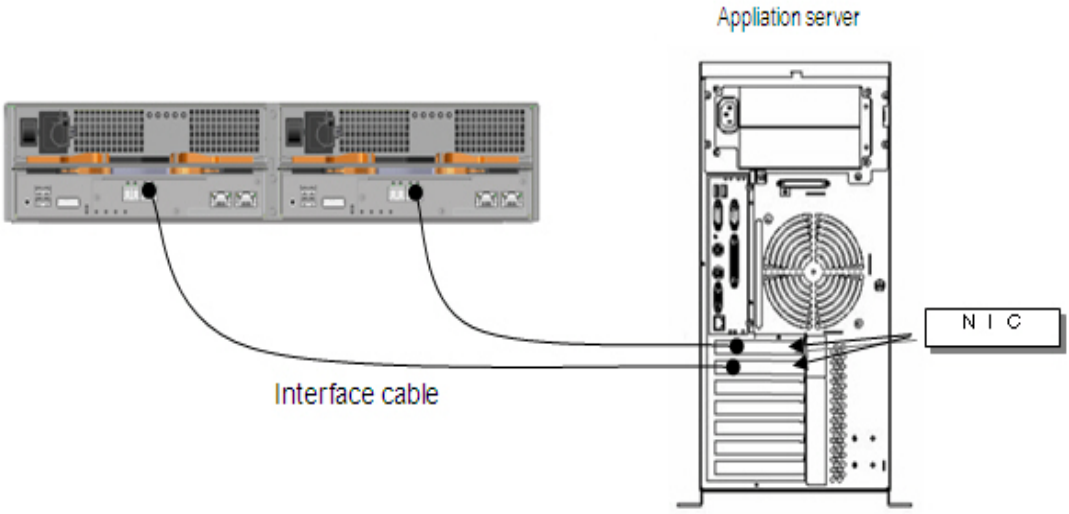

Figure F-3: Configuration Example

The following shows an example of a 10-Gbps iSCSI connection (redundant path configuration in combination with Path Manager).

To implement the following recommended example, two NICs must be installed in the application server and two 10-Gbps cables are needed to connect the disk array controller and NICs.

Use a 10-Gbps cable to connect the NIC to the host port (HP connector) of the disk array controller. (The 10-Gbps cable has the same connector shape on both ends.)

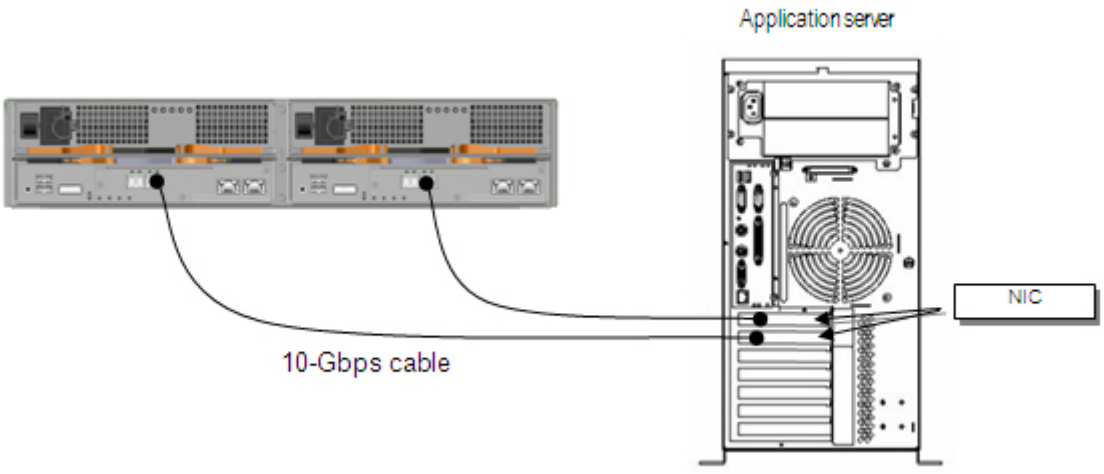

Figure F-4: Configuration Example

1. For the basic requirements when using iSCSI storage for ESX Server systems other than the above, refer to the OS Manual or to information provided on the Web and so on.
2. Prepare VMware Infrastructure Client (VI Client) operating environment

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VI Client is a key component that generates, manages, and supervises virtual machines, virtual machine resources, and virtual machine hosts. VI Client must be installed on a Windows machine that supports network connection of ESX Server or VirtualCenter server environment.

Creating VMKernel Port

The following operations must be performed before configuring iSCSI storage.

- Create a VMKernel port for iSCSI Software Initiator.
- Connect the service console to an iSCSI network (only when with ESX Server 3).

Create a VMKernel port for iSCSI Software Initiator

1. Log in to VI Client.
2. After selecting a server from the Inventory panel, click the **Network** button for the configuration. This opens the Hardware Configuration page.
3. Click **Add network**.
4. Select **VMKernel** in the **Connection Type** screen of the Add Network Wizard, and then click the **Next** button.

NOTE: With ESX Server 3i, the Service Console option is not shown in the wizard screen.

5. In the **VMKernel – Network Access** screen of the Add Network Wizard, select the vSwitch to be used or select **Create Virtual Switch**. Next, select the check box for the network type used by vSwitch, and then click the **Next** button.
6. Under Port Group Properties in the **VMKernel: connection setup** screen of the Add Network Wizard, select or type a network label and VLAN ID. For the IP setting, enter the IP address and subnet mask. After completing the settings, click the **Next** button.

- **Network Label:** This name identifies the port group being created. When using this name to configure a VMKernel service such as Vmotion or IP storage, this label specifies the virtual adapter to connect to the port group.
- **VLAN ID:** This identifies the VLAN used for the port group's network traffic. A VLAN ID is not required. Check with the network administrator to determine whether or not this must be set.

1. A warning alarm is output if a default gateway has not been set. Click the **Yes** button.

CAUTION: A gateway setting is required when connecting to a machine that is not set for the same IP subnet as the service console (ESX Server 3 only) or VMKernel.

2. Set the IP address of each gateway corresponding to the "routing" service consoles and VMkernel in the **DNS and Routing Configuration** screen. After completing the settings, click the **OK** button.
3. Click the **OK** button. Check the content of the **Settings Completed** screen. If there are no problems, click the **Finish** button.

Connect the service console to an iSCSI network (only when with ESX Server 3)

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After creating a VMKernel port for iSCSI Software Initiator, connect a service console with the same vSwitch as for the target VMKernel port.

IMPORTANT: This operation is not required when using ESX Server 3i.

1. After logging in to the VI Client, select a server from the Inventory panel. This opens the Hardware Configuration Page for this server.
2. Click the **Network** button for the configuration.
3. On the right side of the screen, click the **Properties** button for the vSwitch associated with the created VMKernel port.
4. Click the **Add** button for the port.
5. After selecting **Service console** in the **Connection Type** screen of the Add Network Wizard, click the **Next** button.
4. On the **Service Console: Connection Settings** screen of the Add Network Wizard, enter a Network label to identify the port group that was created under **Port Group Properties**.
5. Select either **Automatically retrieve IP settings** or **Use the following IP setting**.
   a. If you selected **Use the following IP setting**, enter the IP address and subnet mask, then click the **Edit** button.
   b. Enter the IP address of the default gateway for service control. When settings are completed, click the **Next** button.
   c. In the **Settings Completed** screen of the Add Network Wizard, use the Preview function to check that vSwitch has been correctly configured, and then click the **Finish** button.

Setting up Software iSCSI Initiator

To configure Software iSCSI Initiator, activate Initiator and then set the target address for Initiator. This section describes the parameter settings related to CHAP authentication.

Activate software iSCSI Initiator, so that ESX Server can be used.

1. After logging in to VI Client, select a server from the Inventory panel.
2. Click the **Storage Adapter** button under the hardware to be configured. (A list of available storage adapters is displayed.)
3. After selecting an available software Initiator from the iSCSI software adapter, click **Properties**.
4. Click the **Configure** button under the **General** tab in the iSCSI Initiator Properties screen.
5. Select the **Enabled** check box under **Status** in the General Properties screen. After completing the settings, click the **OK** button.

6. Set the target detection address so that the software Initiator is able to designate access-enabled storage resources on the network.

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7. Click the **Add** button under the **Dynamic Discovery** tab in the **iSCSI Initiator Properties** screen.
8. Enter the IP address of the server to be used as the target sending **iSCSI server**. After completing the settings, click the **OK** button.

CHAP Parameter Settings

If CHAP authentication will not be used, this step is not necessary.

1. Click the **CHAP Authentication** tab in the **iSCSI Initiator Properties** screen.
- The default CHAP parameters are shown under the **CHAP Authentication** tab.
- To change these CHAP parameters, click the **Configure** button.

2. Click the **CHAP Authentication** tab in the **iSCSI Initiator Properties** screen and change the following settings. After completing the settings, click the **OK** button.

Certificate

- Select the **Use the following CHAP credentials** option to activate CHAP authentication function.
- Select the **Use Initiator Name** option to use the Initiator name as the CHAP name. Enter any CHAP name to be used instead.
- Enter the CHAP Secret in the **CHAP Secret** box.
- Select **Disable CHAP authentication** to disable the CHAP authentication function.

IMPORTANT: For sessions after CHAP setup, the CHAP Secret is used to authenticate the Initiator. This has no effect on any session that has already been established. When CHAP has been disabled, the current session continues until a restart or a forced log-out of the disk array controller is executed. After a restart or a forced log-out of the disk array controller, it is no longer possible to connect to any disk array that requires CHAP authentication.

IMPORTANT: The CHAP Secret that is set here is a password that a target uses to authenticate the Initiator. This password is also required for settings on the disk array side (see *Section: 13.2.21 iSMcfg setIdsetchap in the SnapSAN Manager Command Reference*), so be sure to write it down so it is not forgotten.

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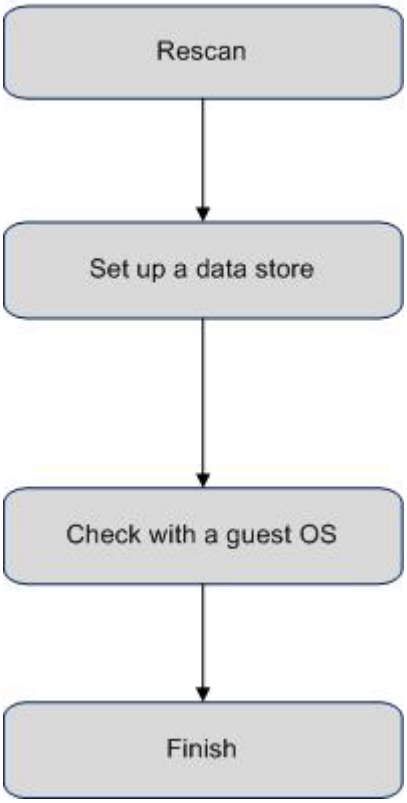
Checking Connection from Application Server

Perform the following steps to connect the application server and disk array controller in a VMware environment.



After executing a rescan, make sure that a list of available adapters is shown by the software iSCSI Initiator used to access software- activated iSCSI storage disk array controllers.

For details, refer to *Section : Executing Rescan*.

Set up a data store for the software-activated iSCSI storage device.

For details, refer to *Section : Setting up a Data Store*.

Make sure that the logical disks are recognized by the Guest OS.

For details, refer to *Section : Confirmation Using Guest OS*.

Executing Rescan

Perform the following steps:

1. Use VI Client to select a server, then select **Storage Adapter** as the configuration hardware setting.
2. Click **Rescan** under **Storage Adapter**.

IMPORTANT: Select an available software Initiator from displayed list of available iSCSI software adapters. This brings up a display of Initiator details such as the model name, IP address, iSCSI name, detection method, iSCSI alias, and various detected targets.

3. Click **Properties** in **Details**.
4. Properties that can be added are shown under the **General** tab of the **iSCSI Initiator Properties** screen.

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IMPORTANT: The software Initiator configuration and default properties can be changed.

Setting up a Data Store

Create a data store for a software-activated iSCSI storage device. After creating it, execute a rescan. Disk/LUN from the ESX Server system can be used.

1. Use the VI Client to select a server, and then select **Hardware** > **Storage** under **Configuration**.
2. Click **Add storage**.
3. Select **Disk/LUN**, and then click the **Next** button.
4. Select the iSCSI device to be used for the data store, and then click the **Next** button.
5. **Current disk layout** is displayed. Check the current disk array layout. If there are no problems with the settings, click the **Next** button.
6. The Disk/LUN Properties are now shown. Enter the data store name.

After completing the settings, click the **Next** button.

IMPORTANT: The data store name is shown in the VI Client. The label must be unique within the current instance of the virtual Infrastructure.

7. Adjust the file system values and area to be used for data store. The default settings is to set the storage device for all empty areas. After completing the settings, click **Next**.
8. When the **Completed Settings** screen appears, check the data store configuration. If there are no problems with the settings, click the **Finish** button.

NOTE: Until now, a data store has been created in an iSCSI storage device that can be accessed by Software Initiator.

9. Click the **Change** button.

Confirmation Using Guest OS

Perform the following steps to confirm that the logical disks are recognized by the guest operating system:

Confirmation in Windows Environment

1. Select **Administrative Tools** > **Computer Management** > **Disk Manager** to start.
2. Click **Disk drives** and check the number of logical disks (No. of logical disks assigned to server × No. of access paths from server to individual logical disks) and the respective disk drive names (DISK ARRAY SCSI Disk Device).

NOTE: If nothing is shown, check the software iSCSI Initiator settings for the ESX Server environment, the server-Storage connections, NIC driver settings and so on.

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3. Open **Disk Management** and check the number of logical disks (number of logical disks assigned to server).

Confirmation in Linux Environment

Run the following command to check the number of logical disks (No. of logical disks assigned to application server × No. of access paths from application server to individual logical disks) and the respective vendor and model names (DISK ARRAY).

```
# cat /proc/scsi/scsi
```

IMPORTANT: If nothing is shown, check the software iSCSI Initiator settings for the ESX Server environment, the server-Storage connections, NIC driver settings and so on.

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Appendix G

Path Manager Installation

This appendix provides the steps you should follow while installing Path Manager software in a Windows or Linux application server.

For Windows Application Server

Use the setup CD-ROM and follow the steps below to install Path Manager in a Windows application server:

1. Turn off the power supply of the server first and then disconnect all connections between the server and the disk array controller. When SAN boot is enabled, the server should be connected to the disk array controller via a single connection.
2. Power on the server and log in as a user having administrative authority (built-in-administrator for Windows Server 2008) for the server where Path Manager will be installed. Insert the setup CD-ROM of Path Manager in the CD/DVD drive of the server.
3. When the message shown below or a similar message appears, click **Yes**. If no message is shown, run "iSpmStarter.exe" located in the root directory of the setup CD-ROM of Path Manager.

Installation

Use the Setup CD and the following procedures to install Path Manager.

1. Turn the server off. Completely disconnect the server and Path Manager for Windows.
   If you install on the SAN boot environment, connect the server and Path Manager for Windows with one access path.
2. Turn the server on. Log in as an administrator of the server (if Windows Server 2008, must be built-in administrator).
3. If you are going to setoup Path Manager to 320Fb models, stop "HAS Volume Monitoring Service" before installation, and restart after completion, see "Chapter 6 HAS Volume Monitoring Service".

Setup

4. Insert the Setup CD into the CD/DVD drive unit.
5. If the dialog box shown below is appeared, click "Yes."
   If the dialog box is not appeared, run "iSpmStarter.exe" in the root directory of Setup CD(When you install on the Server Core environment or NS series, the dialog box will not be displayed.).

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NOTE: You need to launch iSpmStarter.exe directly if your environment is Server Core. Move current directory to root of a CD/DVD drive before launching iSpmStarter.exe for this situation,

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NOTE: If you setup by non-built-in administrator account, the dialog box shown as below may appear.

- If you meet this dialog box, click “Continue”.

6. The InstallShield Wizard for Path Manager will start. Depending on the state of your server, the wizard shows one of the two dialogs shown below.
7. If you are installing Path Manager on the server for the first time, the **Welcome to the InstallShield Wizard for** Path Manager dialog box will be displayed. Click “Next” and continue to procedure (7).

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NOTE: If this version of Path Manager is already installed, the Path Manager Maintenance dialog box will be displayed. Click "Cancel." To uninstall the installed Path Manager, refer to "2.2 Uninstallation."

8. The **License Agreement** dialog box is displayed. Review the license agreement and select the option "I accept the terms in the license agreement." Click "Next."
9. Click "Next."

On installing Path Manager, setup program also installs the option "MultiPath I/O" feature of the Windows. You can confirm which features are installed in the server manager.

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The Registration window will be displayed, click Next.

The **InstallShield Wizard Completed** dialog box will be displayed. Click "Finish."

10. The dialog box shown below will be displayed indicating a reboot is necessary. Click "Yes" to reboot the server.

NOTE: Do not re-setup Path Manager before reboot the server. Be sure to reboot the server if you re-setup Path Manager.

11. After the server reboots, connect Path Manager for Windows to the server. Path Manager automatically recognizes disk subsystems and paths and starts operating.

If your environment is Windows Server 2008 or Windows Server 2008 R2, please apply the following MPIO hotfix:

[The MPIO driver fails over all paths incorrectly when a transient single failure occurs in Windows Server 2008 or in Windows Server 2008 R2]:

http://support.microsoft.com/kb/2522766

The installation of Path Manager is now complete.

For Linux Application Server

Perform the following steps to install Path Manager in a Linux application server:

1. Navigate to the mount directory.
   (For auto mount, the user is navigated to the auto mount directory.)

```
# cd /media/cdrom
#
```


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2. Specify the `-i` option to install the RPM file (run the underscored command).

---

* 1. If the `--silent` option is not specified, the OS will not be restarted. (The OS must be restarted before you start using Path Manager.)

* 2. The `--iscsi` option must be specified for the iSCSI connection. Specify the `--iscsi` option if the FC connection and the iSCSI connection are used together.

When the kernel version number is 2.6.18-238.el5 (FC connection)

```
# sh install.sh -i --silent
====== Precheck for SPS Installation / Uninstallation =======
Distribution : RedHat
Architecture : i686
Kernel Version: Linux2.6
Kernel Details: 2.6.18-238.el5
--------- The following packages will be installed. ---------
driver : ./100/RPMS/RHEL5/5.6/IA32/sps-driver-E-5.0.0-
2.6.18.238.el5.i686.rpm
utils : ./100/RPMS/RHEL5/5.6/IA32/sps-utils-5.0.0-0.i686.rpm
=============================================================
Preparing... ########################################### [100%]
1:sps-driver-E ##########################################
[100%]
Preparing... ########################################### [100%]
1:sps-utils ############################################ [100%]
patching file rc.sysinit
Starting up sps devices:
Couldn't open /etc/sps.conf. No such file or directory.

I try auto setting...
Wait.
parsing... device:/dev/dda (OK)
parsing... disk-info: DISK ARRAY ,0000000935000734,00001 (OK)
parsing... LoadBalance:D2 (OK)
parsing... path-info:0 Host:scsi:8 Channel:0 Id:0 Lun:0
Priority:1 Watch:Enable Status:ACT (OK)
parsing... path-info:7 Host:scsi:7 Channel:0 Id:0 Lun:0
Priority:2 Watch:Enable Status:HOT (OK)
Wait until all /dev/ddX is made..........END
dd_daemon (pid 3963) is running...
sps Install Completed......
#
Broadcast message from root (Thu Feb 25 14:15:57 2010):
The system is going DOWN for reboot in 1 minute!
```


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3. When the installation is completed successfully, the message, `sps Install Completed` (shaded area) is reported. If this message is not shown, it indicates the installation has failed, in which case, see *Software* Path Manager *for Linux User's Manual* for information and actions to be taken.
4. When the installation is finished successfully, the system restarts after 1 minute. Check if the OS is operating successfully.

The installation of Path Manager is now complete.

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Appendix H

MSCS with Windows Server 2003

When you are using Microsoft Cluster Service (MSCS) in the Windows Server 2003 environment, the value set to each server by the MSCS specifications must match the SnapSAN Manager Target ID and LUN (number) values recognized by each server. Cluster setup does not work when different values are set.

For details, refer to the following URL:

[KB331801] Cluster setup may not work when you add nodes.

http://support.microsoft.com/kb/331801

Target ID

The following describes a connection method related to setup of matching values as the Target IDs of disk array controller controllers recognized by the server.

- When directly connecting server (HBA) and disk array controller,Set matching values to the Loop Switch ID of the disk array controller controller.

The Switch ID that is set becomes the Target ID recognized by the server.

Similarly, when there are multiple connection paths between servers and disk array controllers, set the same values to the Loop Switch IDs of all controller ports to be connected.

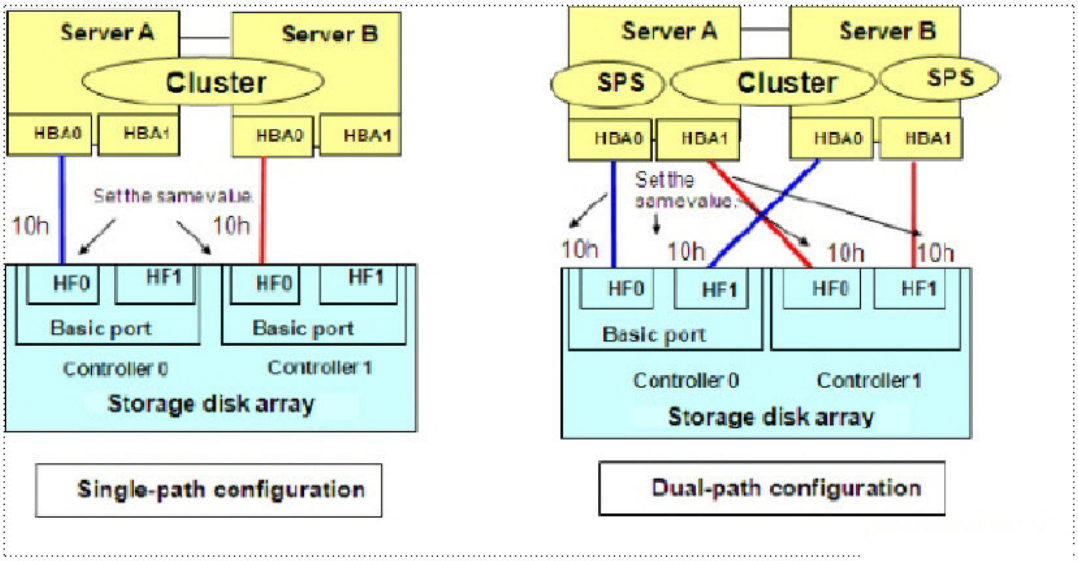

Figure H-1: Direct Connection

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- When connecting to FC switches, such as N8190-119 in Loop Topology

Set identical Loop Switch ID values to controllers of the same disk array controller.

The Switch ID that was set becomes the Target ID recognized by the server.

When multiple disk array controllers are connected to FC switches, different Loop Switch ID values must be set to each disk array controller. Normal operation will not occur if matching values are set.

NOTE: Because FC switches in a Loop Topology require different Loop Switch IDs within FC switches, a configuration cannot be built using just one FC switch.

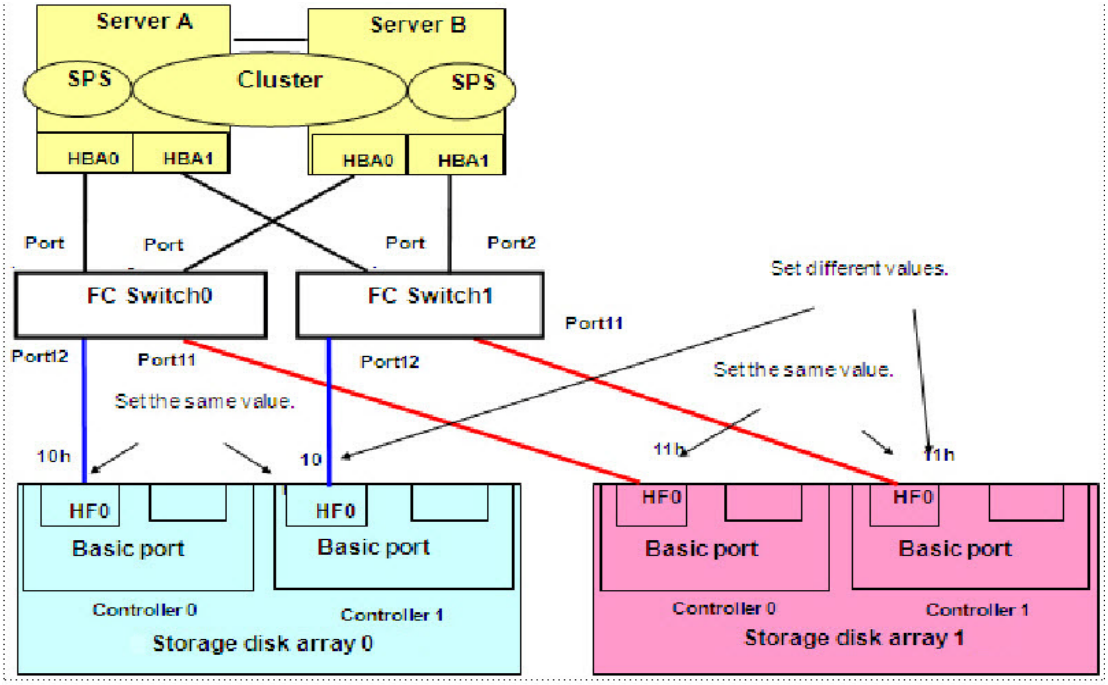

Figure H-2: Connecting to Loop Topology FC Switch

- When connecting to a Fabric Switch, such as N8406-040/042

As shown in the figure below, for each Fabric Switch or each Zoning group, connections from servers and disk array controllers must be linked to the same port number on each switch.

Target IDs starting from 0 are assigned to targets that are recognized by the server starting from the lowest N_Port ID value (lowest port number of switch).

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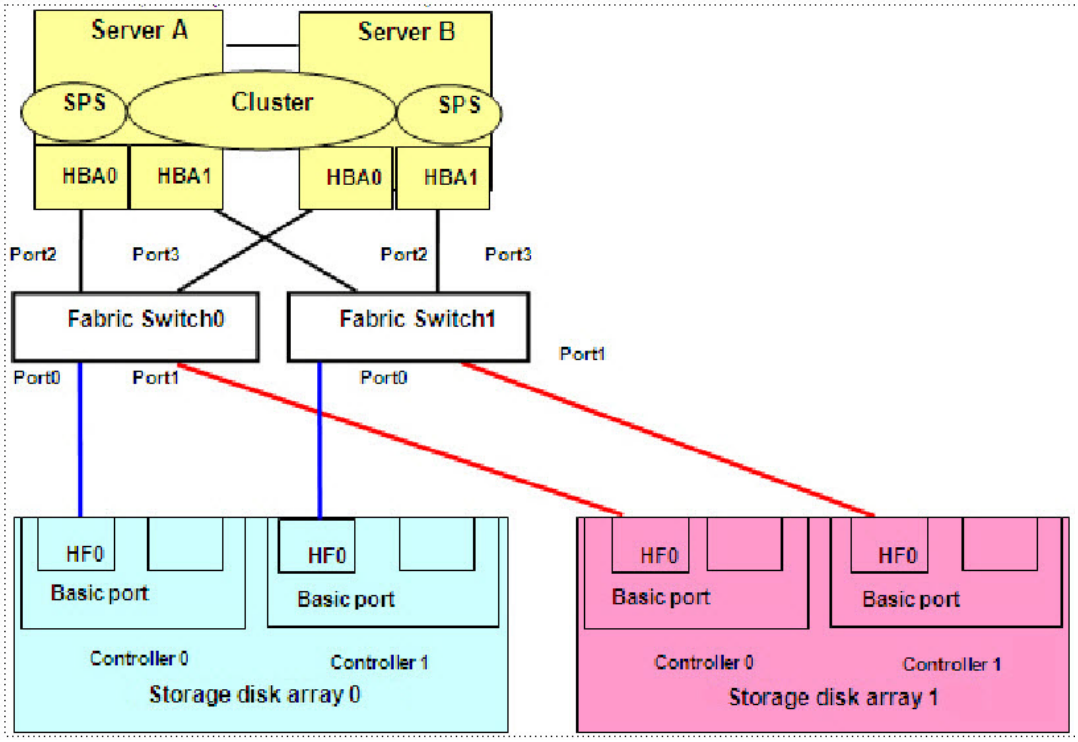

Figure H-3: Connecting to Fabric Switch

Table H-1: Connection of Switch

Switch No. Port No.	Connected Device	Switch ID	Target ID	
Switch0 - Port0	iStorage0-Cont0	10h	0	Recognizes targets connected to fabric switch in detected order and assigns Target ID from lower switch port number. Target ID for the first detected target will be 0. Secondly, detected target will have "Target ID = 1 and so on.
Switch0 - Port1	iStorage1-Cont0	12h	1	
Switch0 - Port2	server A-HBA0	-	-	
Switch0 - Port3	server B-HBA0	-	-	
Switch1 - Port0	iStorage0-Cont1	11h	0	
Switch1 - Port1	iStorage1-Cont1	13h	1	
Switch1 - Port2	server A-HBA1	-	-	
Switch1 - Port3	server B-HBA1	-	-	

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IMPORTANT: IIf you connect wrong Path Manager to Ports of Switch0 and Switch1, you cannot perform cluster setup since Target IDs differ between controller 0 and controller 1.

Swtich0 - Port0 : Path Manager 0 - Cont0 Target ID 0
Swtich0 - Port1 : Path Manager 1 - Cont0 Target ID 1
Swtich1 - Port0 : Path Manager 1 - Cont1 Target ID 0
Swtich1 - Port1 : Path Manager 0 - Cont1 Target ID 1

Logical Unit Number

This section describes a method for setting matching values as the Logical Unit Number (LUN) of disk array controllers recognized from the server.

Each disk array controller includes an access control function that masks logical disks and maps LDNs starting from LUN0. If this access control is not being used, the logical disk number (LDN) of a logical disk configured in a disk array controller becomes the Logical Unit Number (LUN) that can be accessed from the server.

When access control is used, it becomes possible to change LUN (number) that can be accessed from the server.

For example, when LDN00 to 03 are in a disk array controller, access control can set LDN00 = LUN00, LDN01 = LUN01, LDN02 = LUN02 as recognized from Server A and LDN00 = LUN01, LDN01 = LUN02, LDN03 = LUN00 as recognized from Server B. In this case, there are different LDNs for the LUN that is recognized from Server A and the LDN that is recognized from Server B.

- When access control is not used

No settings are necessary.

- When access control is used

When you are setting access control, LDNs within a disk array controller must be set so that the same LUN (number) is recognized from each server.

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